Estimation of Yarn-Level Simulation Models for Production Fabrics

Supplementary Document

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Contents

YARN PROPERTIES

The following table contains the properties of all yarns present in the fabrics of the data set: material, denier (i.e., mass density), and stretch stiffness.

Yarn	Denier $[g/9000m]$	Stiffness
167D/72F Polyester	167	7.8033
150D/72F Polyester	150	18.4893
100D/144F Polyester	100	12.1345
75D/96F Polyester	75	11.0559
75D/72F Polyester	75	10.2502
50D/72F Polyester	50	8.3331
30D/12F Polyester	30	13.8818
100D/72F Polyester Celliant	100	8.3180
50D/36F Polyester Celliant	50	7.3233
75D/72F CD Polyester	75	12.3864
75D/72F CD	75	11.0989
55D Spandex	55	0.0387
40D Spandex	40	0.0345
20D Spandex	20	0.0219
70D/72F Nylon	70	4.9953
70D/68F AquaX Nylon	70	5.6660
50D/34F Lycra T400	50	2.5297

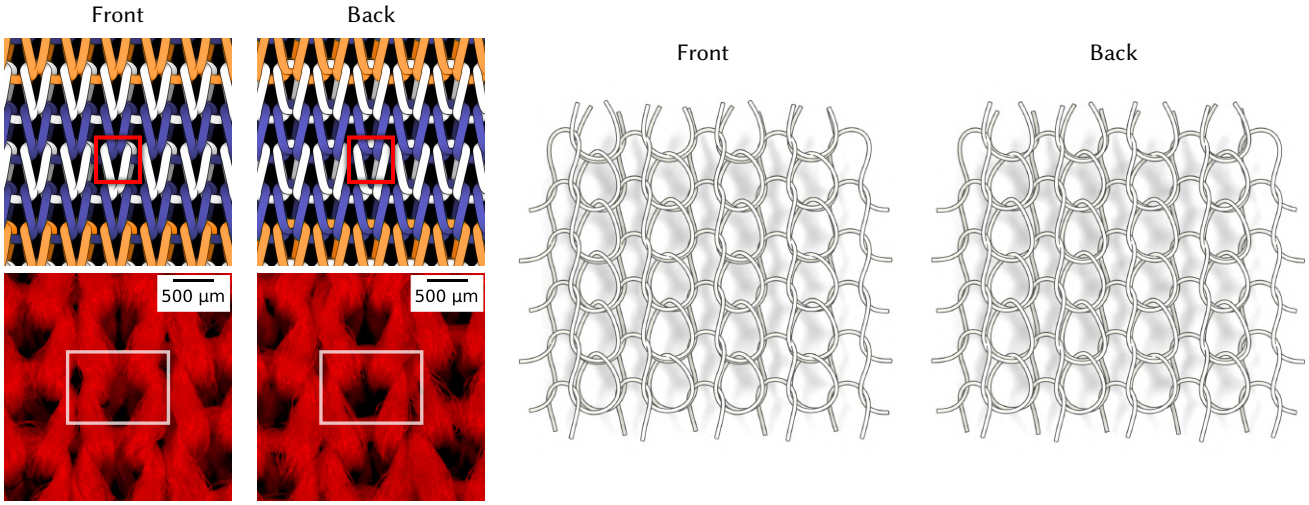
SUMMARY OF PER-FABRIC DATA

The rest of the pages contain per-fabric information, including:

- **Fabric data**: yarn composition; number of threads; fabric density, thickness and finishes; size of the periodic repeat.
- **Knit schematics**, where the rectangles indicate the periodic repeat.
- **High-resolution photographs**, where the rectangles indicate the periodic repeat.
- **Estimated yarn geometry** with a thin stylized radius.
- **Thin-shell parameters**.
- **Thin-shell fit plots**: stretch force, compression, and bending per-direction.
- **Yarn-level fit error** for stretch stress (comfort and full-range), compression, and bending stiffness.
- **Yarn-model parameters**.
- **Yarn-model fit plots**: stretch stress, compression, and bending stress per direction. In the stretch and compression plots, the vertical black lines indicate the comfort range. In the bending plots, the vertical lines indicate the ±20% range for stiffness estimation.
- **Renders of yarn-level simulations** at 50% and 100% of the power stretch on each direction.

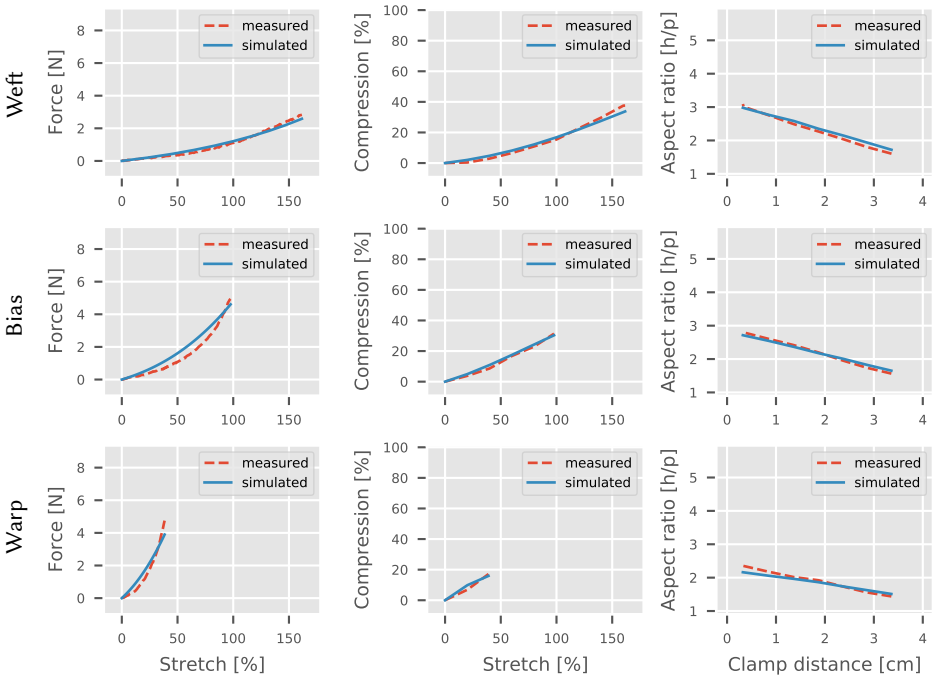
A1: ALL NEEDLE

Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	2	231	1.02	1.24×0.87	-



Thin-Shell Fit

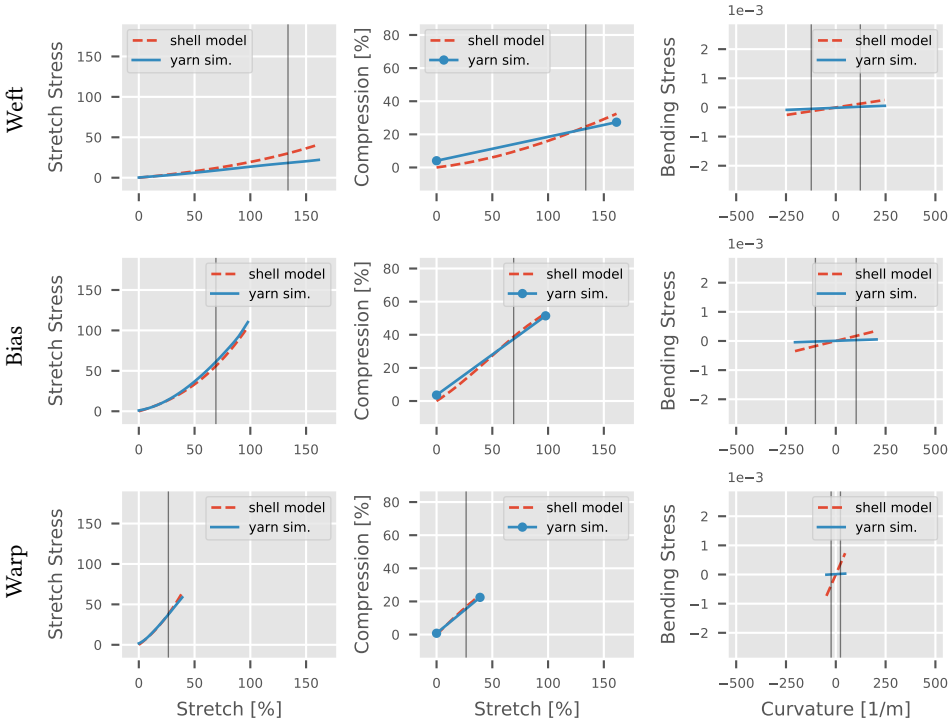
Parameter	Value
k_{xx}	4.77e+00
k_{xy}	0
k_{yy}	9.90e+01
k_{ss}	1.36e+01
k_{n1}	4.54e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	7.80e-06
$k_{\theta,bias}$	8.50e-07
$k_{\theta,warp}$	5.21e-07



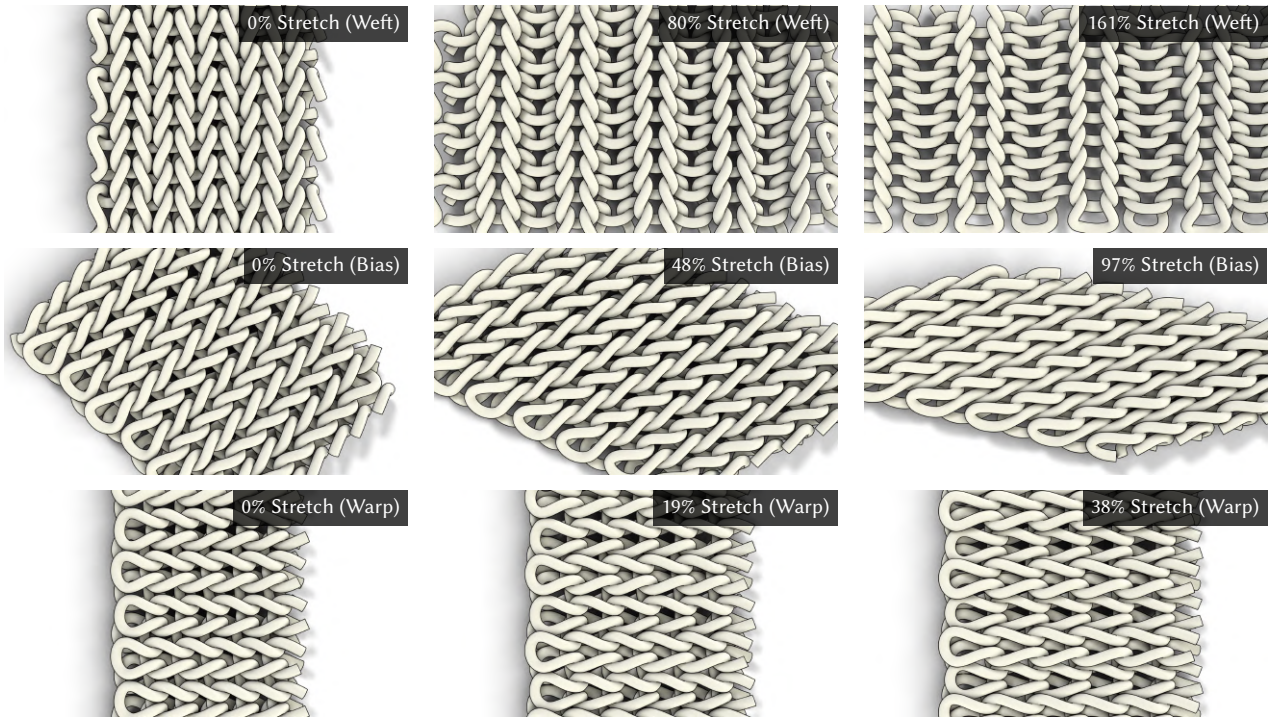
Yarn-Level Fit

Fitting error	%
Comfort Stretch	5
Full Stretch	8
Compression	6
Bending Stiffness	35

Parameter	Value
k_{s1}	2.40e-01
$\bar{\varepsilon}_s$	1.30e-01
k_b	2.37e-09
R_1	1.61e-04
k_{c1}	8.55e+01
k_{s2}	1.85e+01
R_2	6.34e-05
k_{c2}	1.00e+03
R_{visual}	1.57e-04

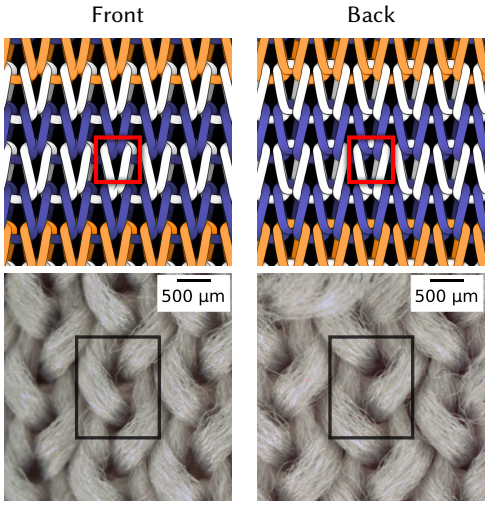


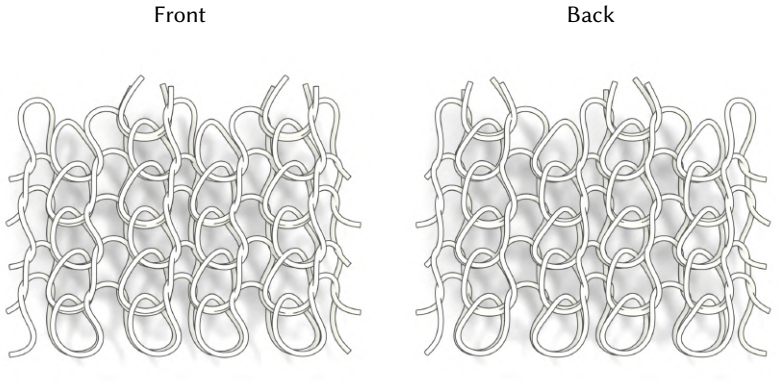
Yarn-Level Simulations



A2: ALL NEEDLE

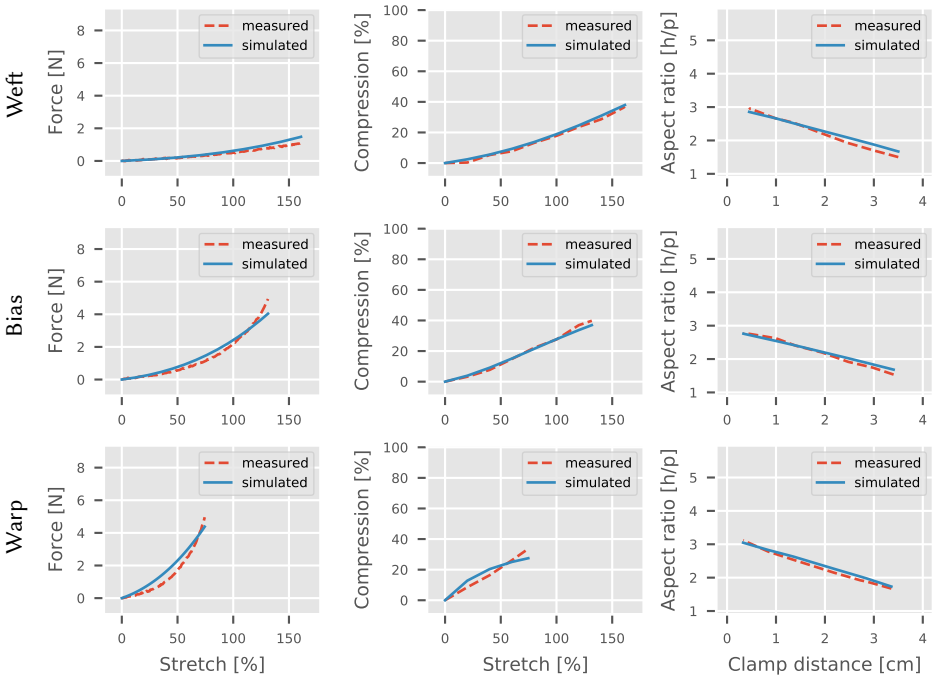
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	3	214	0.67	1.25×1.52	-





Thin-Shell Fit

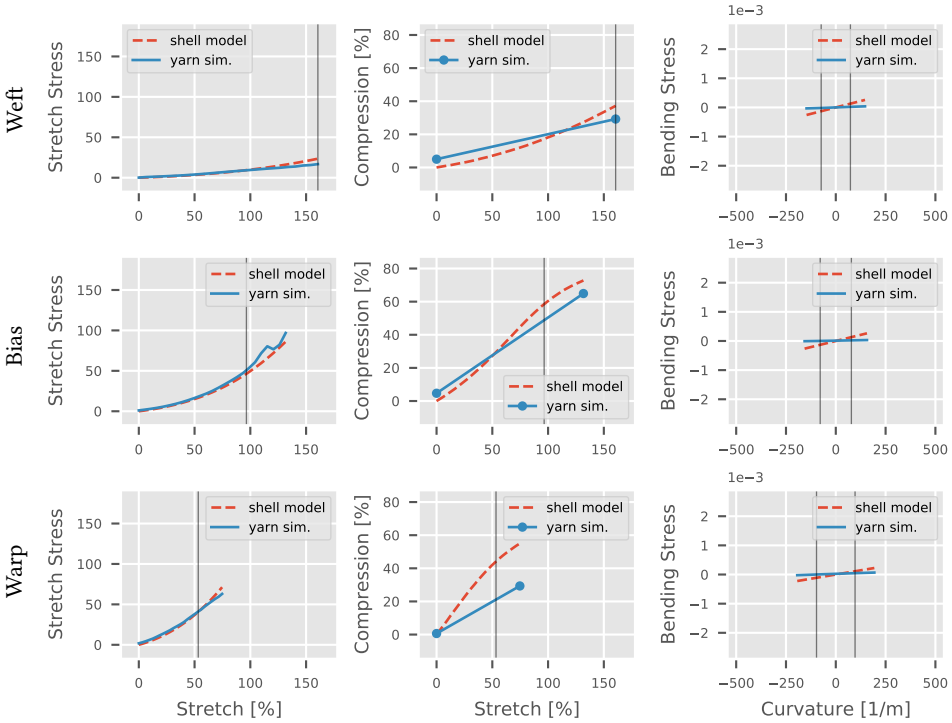
Parameter	Value
k_{xx}	3.31e+00
k_{xy}	2.69e+00
k_{yy}	4.09e+01
k_{ss}	6.00e+00
k_{n1}	8.68e-01
k_{n2}	1.00e-05
$k_{\theta,weft}$	5.77e-07
$k_{\theta,bias}$	8.40e-07
$k_{\theta,warp}$	8.81e-07



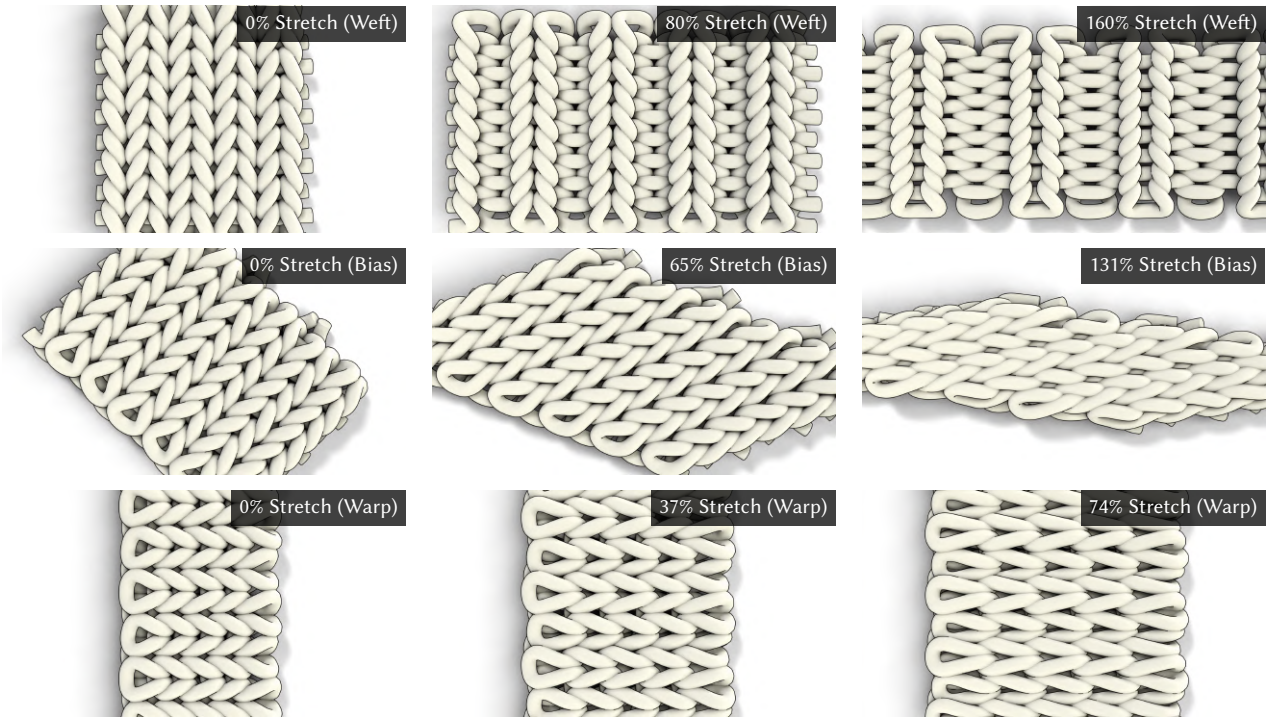
Yarn-Level Fit

Fitting error	%
Comfort Stretch	4
Full Stretch	7
Compression	16
Bending Stiffness	63

Parameter	Value
k_{s1}	1.48e-01
$\bar{\varepsilon}_s$	1.50e-01
k_b	1.97e-10
R_1	1.66e-04
k_{c1}	7.83e+01
k_{s2}	1.03e+01
R_2	4.94e-05
k_{c2}	1.00e+03
R_{visual}	2.17e-04

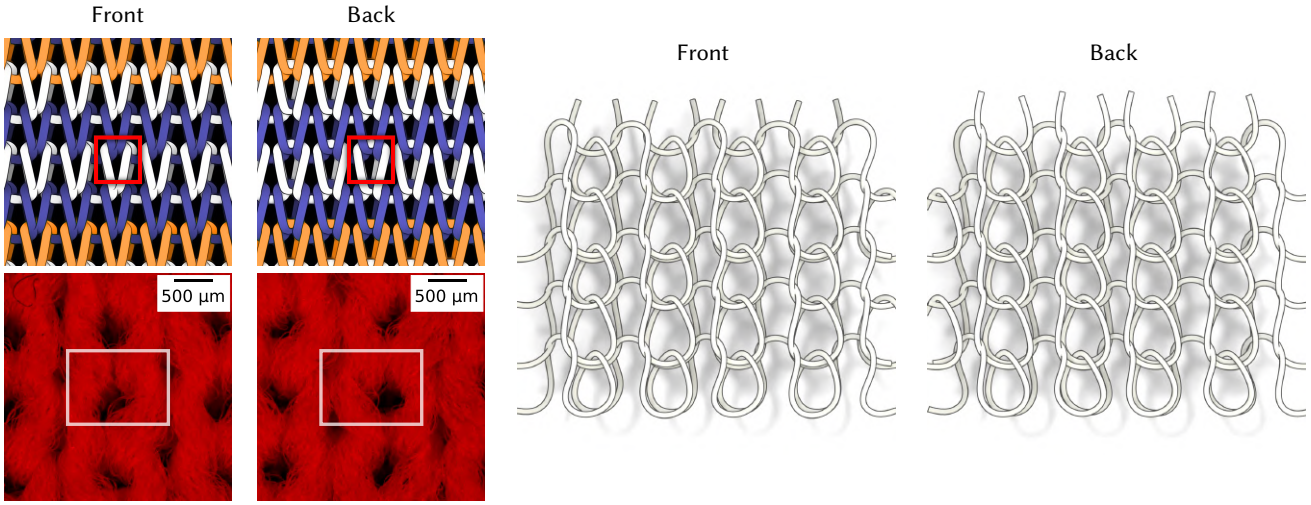


Yarn-Level Simulations



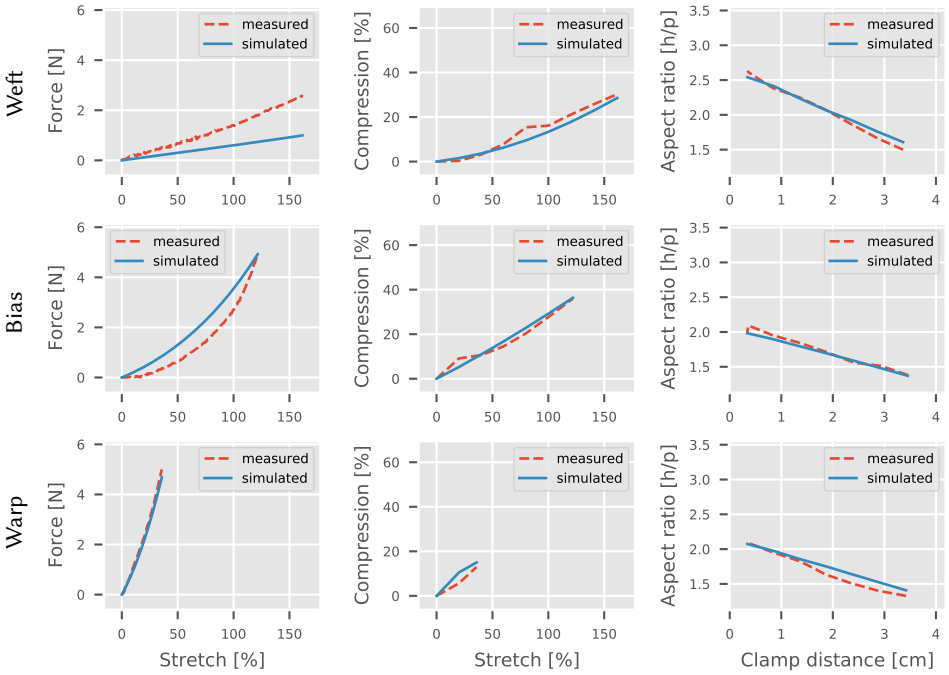
A3: ALL NEEDLE

Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
167D/72F Polyester	100	2	259	1.20	1.30×0.95	-



Thin-Shell Fit

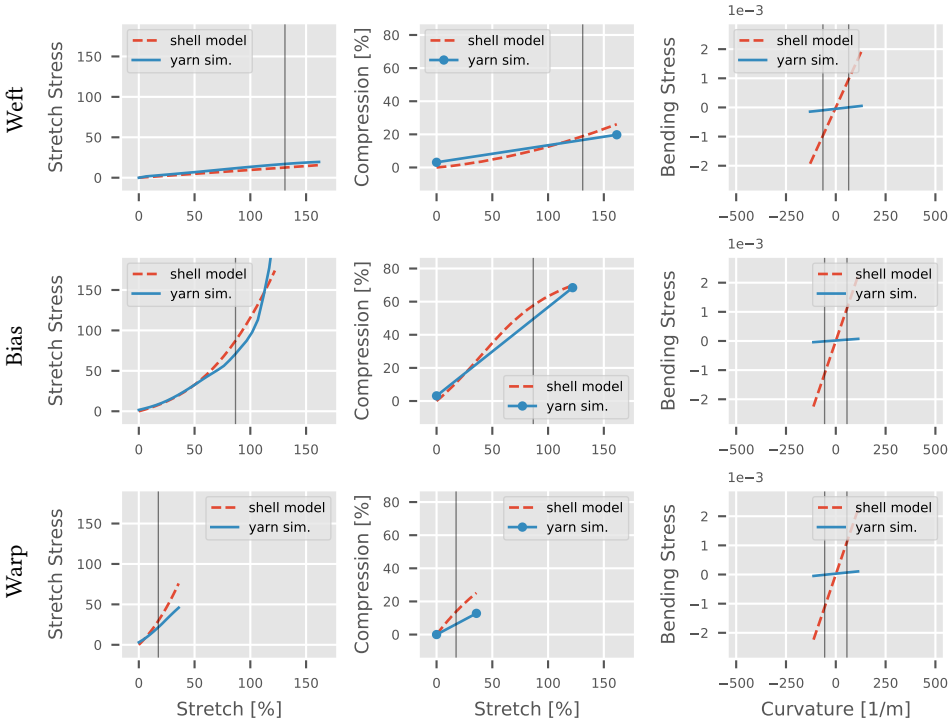
Parameter	Value
k_{xx}	1.22e+00
k_{xy}	0
k_{yy}	1.32e+02
k_{ss}	1.17e+01
k_{n1}	4.54e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.25e-05
$k_{\theta,bias}$	1.36e-05
$k_{\theta,warp}$	1.21e-06



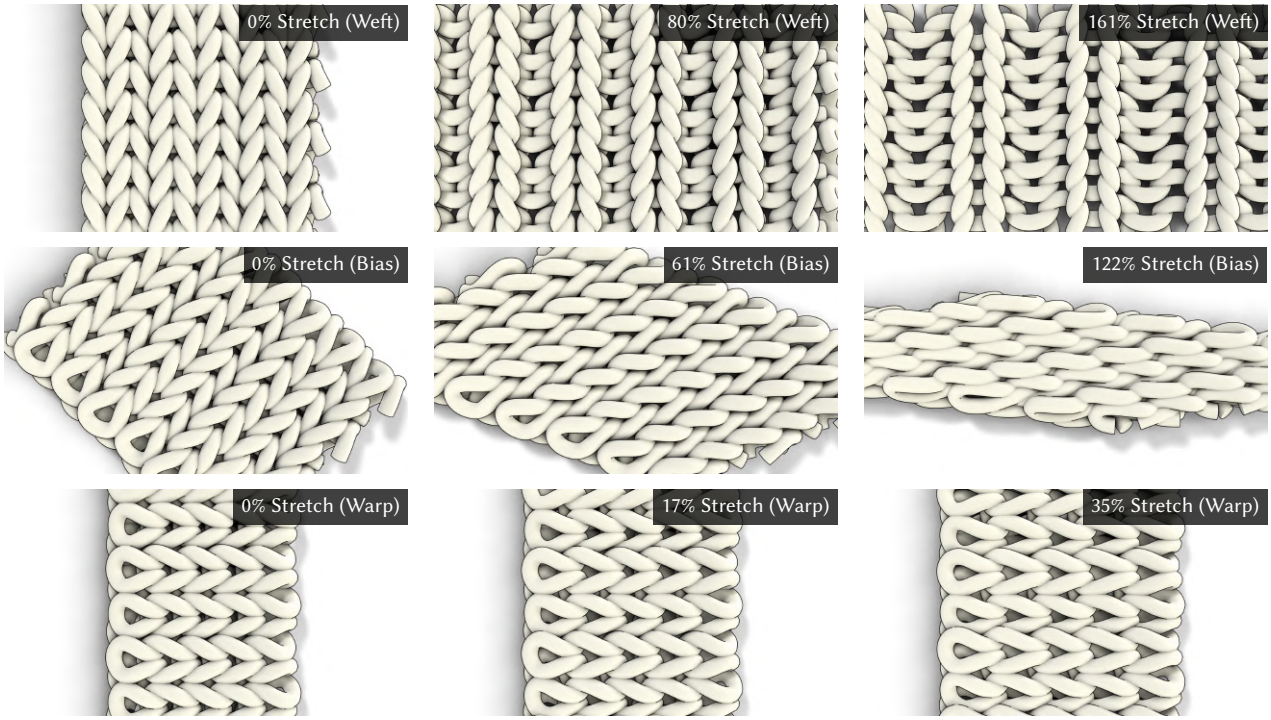
Yarn-Level Fit

Fitting error	%
Comfort Stretch	5
Full Stretch	12
Compression	9
Bending Stiffness	85

Parameter	Value
k_{s1}	2.24e-01
$\bar{\varepsilon}_s$	1.48e-01
k_b	6.36e-09
R_1	1.84e-04
k_{c1}	2.93e+01
k_{s2}	7.80e+00
R_2	7.73e-05
k_{c2}	1.00e+03
R_{visual}	2.43e-04

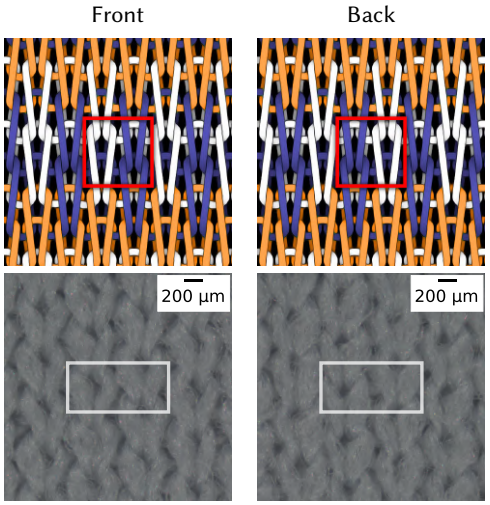


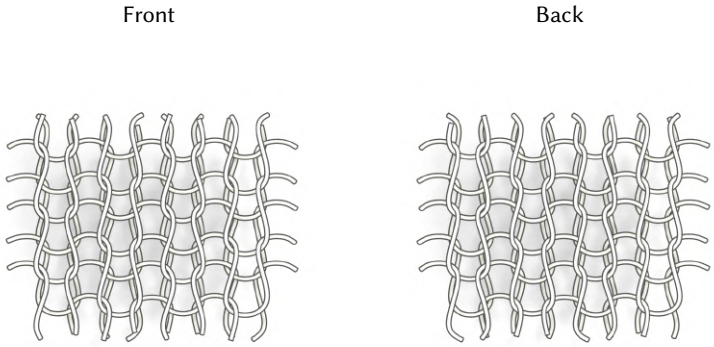
Yarn-Level Simulations



DKIN1: DOUBLE KNIT INTERLOCK

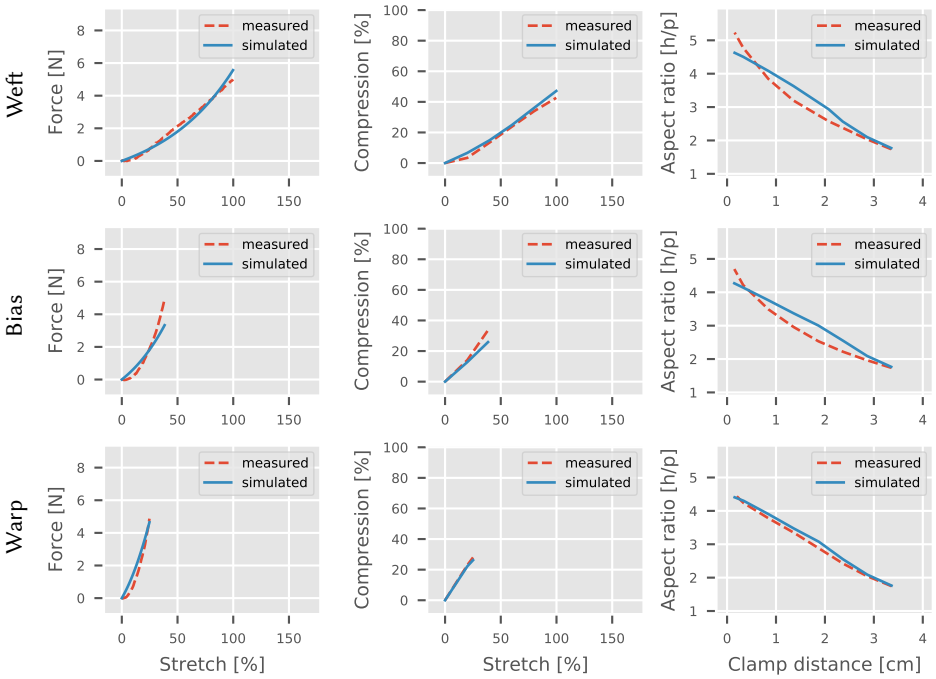
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	1	126	0.41	1.07×0.52	-





Thin-Shell Fit

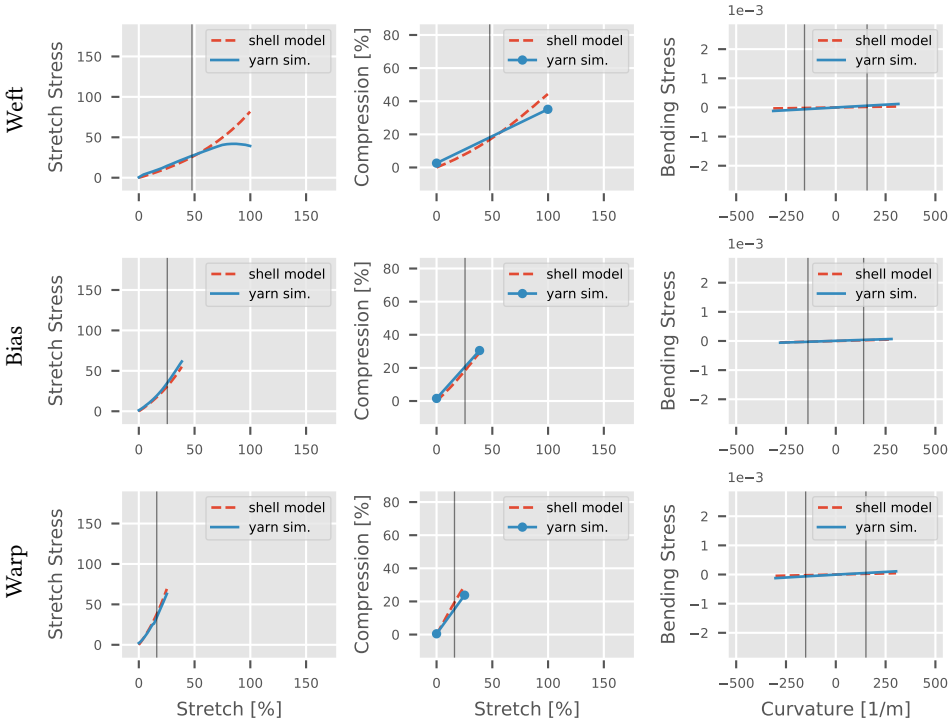
Parameter	Value
k_{xx}	3.88e+01
k_{xy}	5.16e+01
k_{yy}	2.46e+02
k_{ss}	2.75e+01
k_{n1}	4.44e+00
k_{n2}	6.39e+00
$k_{\theta,weft}$	7.58e-08
$k_{\theta,bias}$	8.88e-08
$k_{\theta,warp}$	5.33e-08



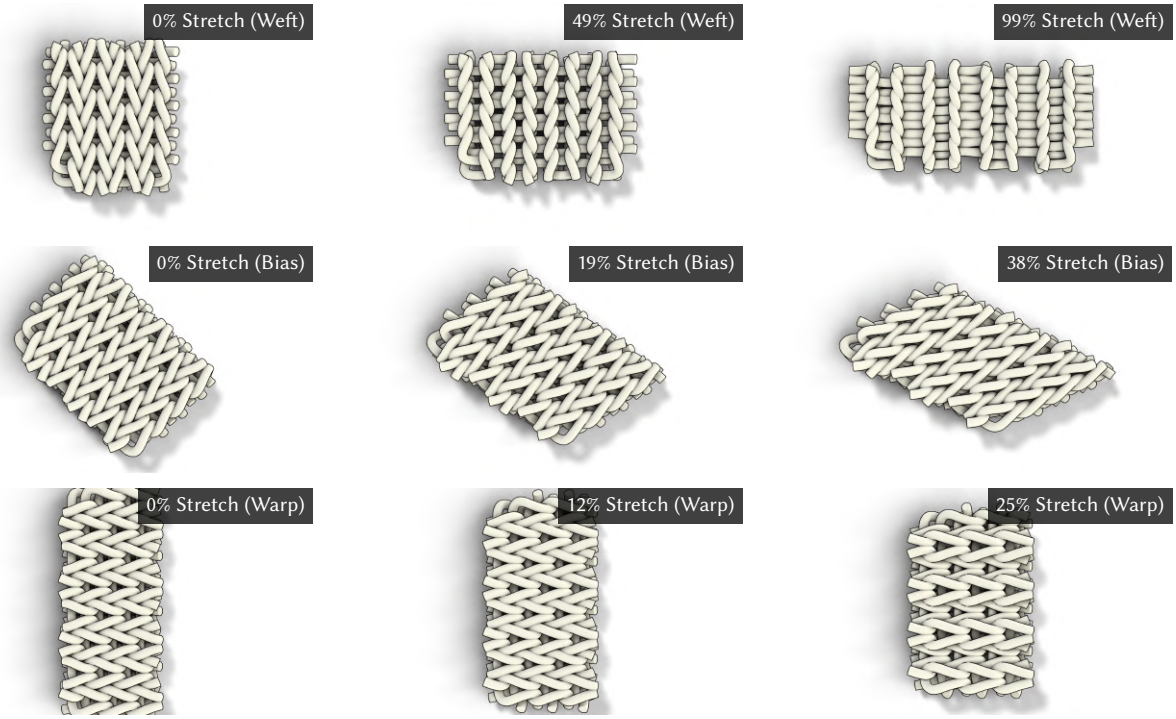
Yarn-Level Fit

Fitting error	%
Comfort Stretch	6
Full Stretch	19
Compression	16
Bending Stiffness	293

Parameter	Value
k_{s1}	1.74e-02
$\bar{\varepsilon}_s$	2.48e-02
k_b	4.47e-10
R_1	8.49e-05
k_{c1}	3.60e+01
k_{s2}	1.03e+01
R_2	2.53e-05
k_{c2}	1.00e+03
R_{visual}	9.06e-05

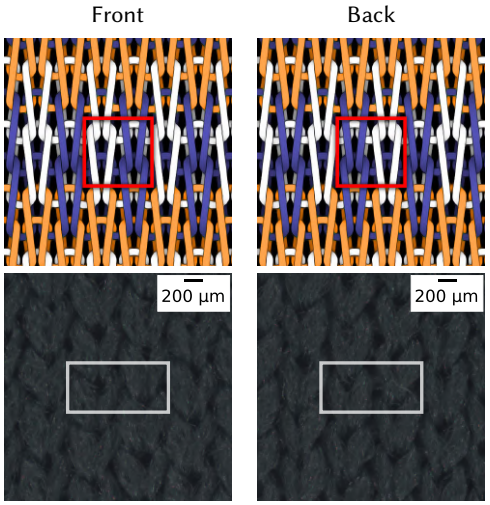


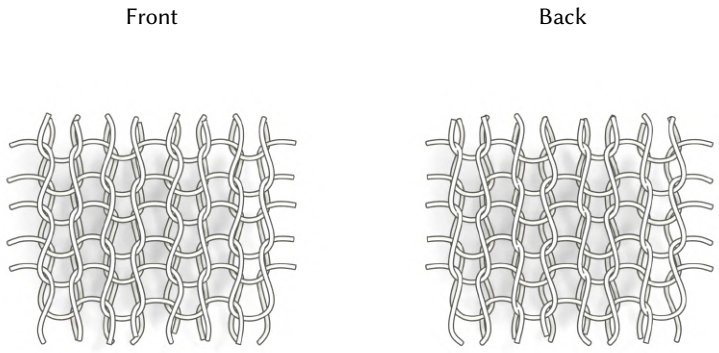
Yarn-Level Simulations



DKIN2: DOUBLE KNIT INTERLOCK

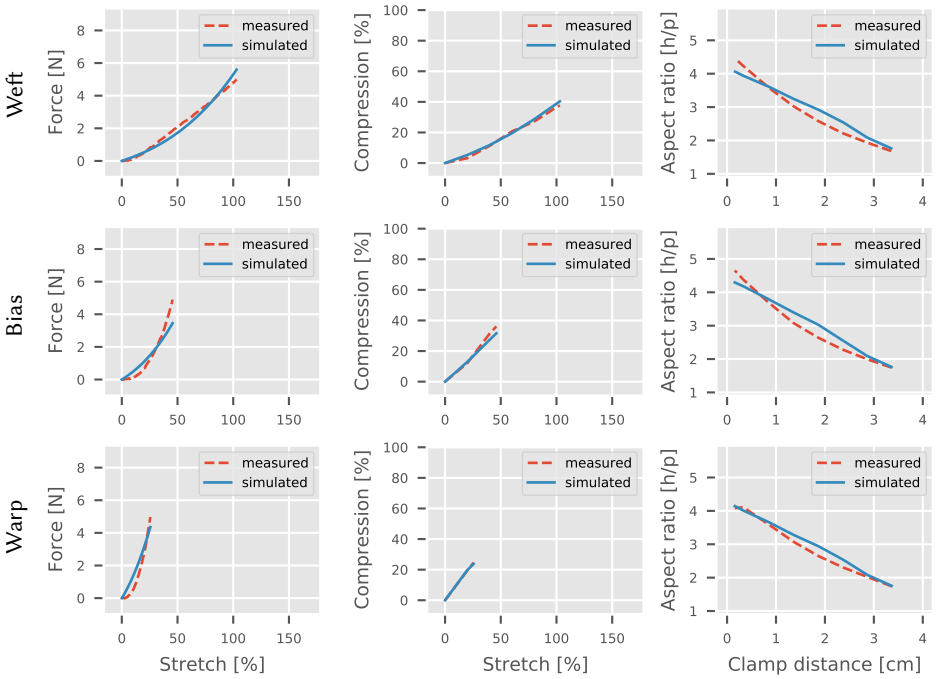
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	1	124	0.47	1.10×0.54	Anti-microbial





Thin-Shell Fit

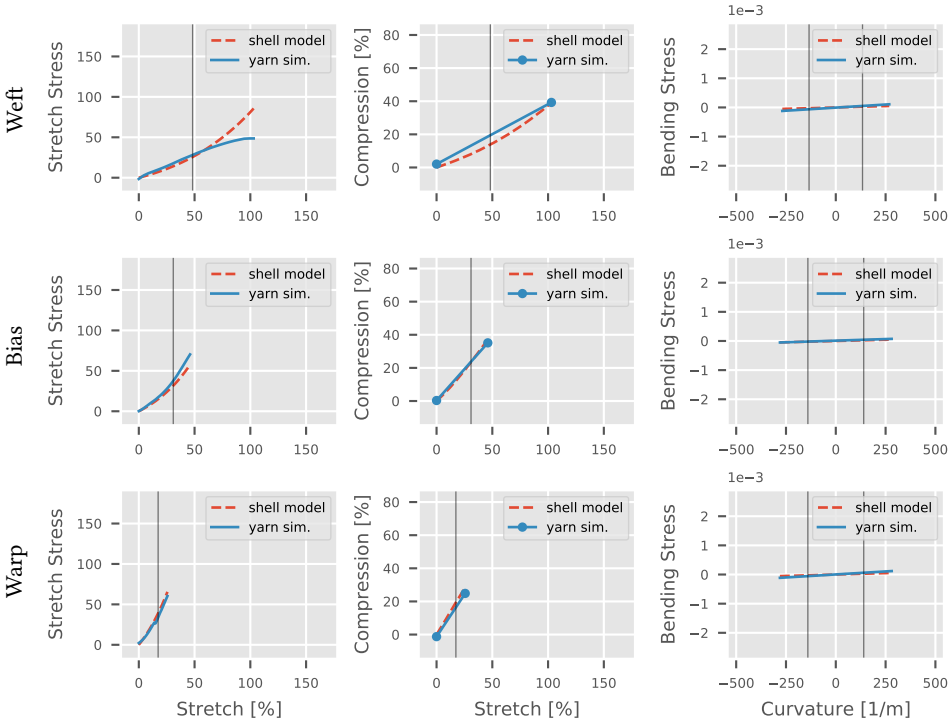
Parameter	Value
k_{xx}	3.41e+01
k_{xy}	3.76e+01
k_{yy}	2.14e+02
k_{ss}	2.15e+01
k_{n1}	2.18e+00
k_{n2}	4.59e+00
$k_{\theta,weft}$	9.80e-08
$k_{\theta,bias}$	8.52e-08
$k_{\theta,warp}$	9.54e-08



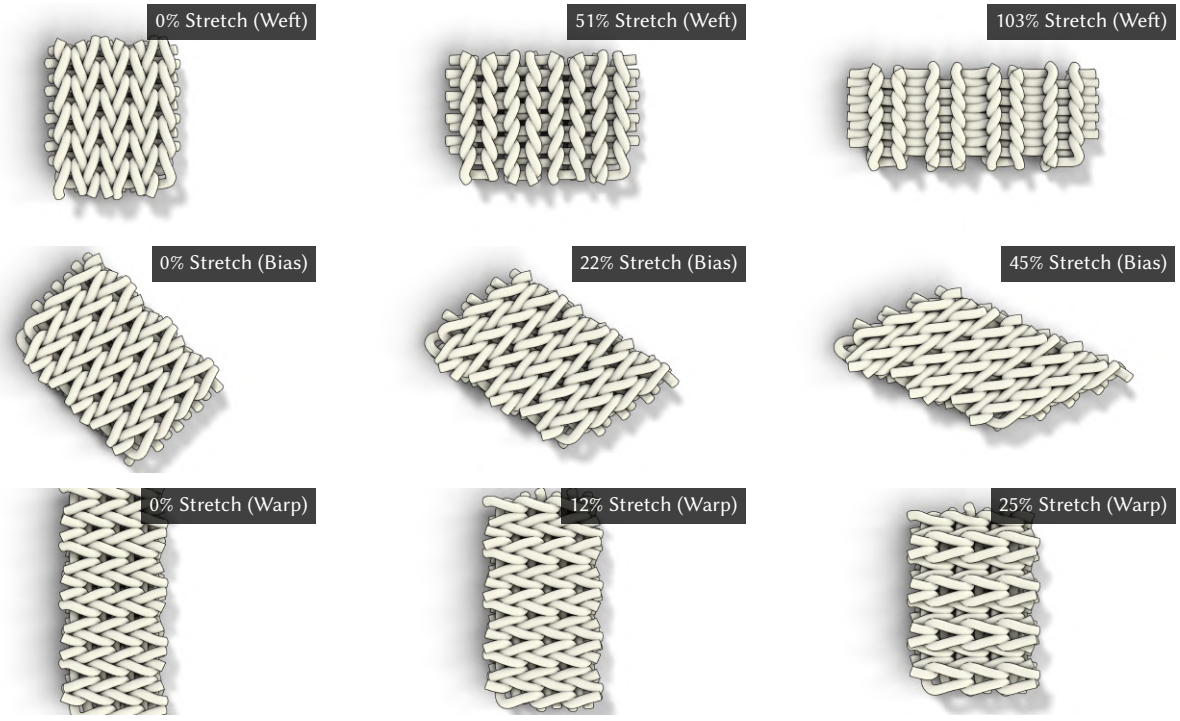
Yarn-Level Fit

Fitting error	%
Comfort Stretch	7
Full Stretch	19
Compression	11
Bending Stiffness	266

Parameter	Value
k_{s1}	1.03e-02
$\bar{\varepsilon}_s$	2.17e-02
k_b	2.41e-10
R_1	8.97e-05
k_{c1}	4.49e+01
k_{s2}	1.03e+01
R_2	2.79e-05
k_{c2}	1.00e+03
R_{visual}	9.48e-05

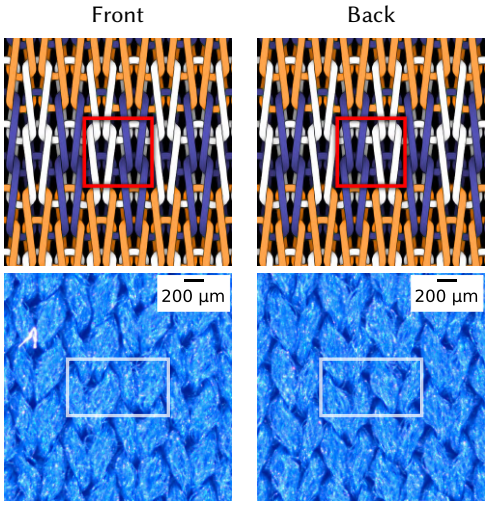


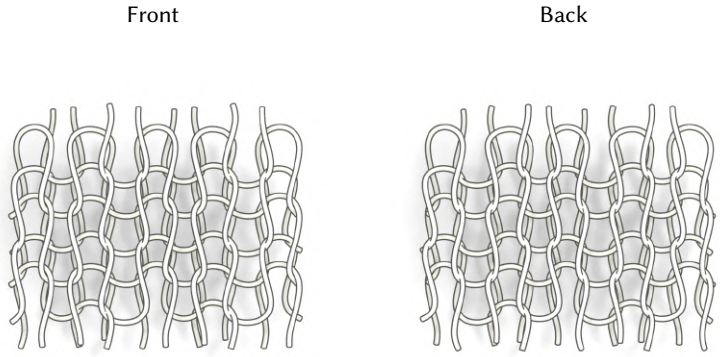
Yarn-Level Simulations



DKIN3: DOUBLE KNIT INTERLOCK

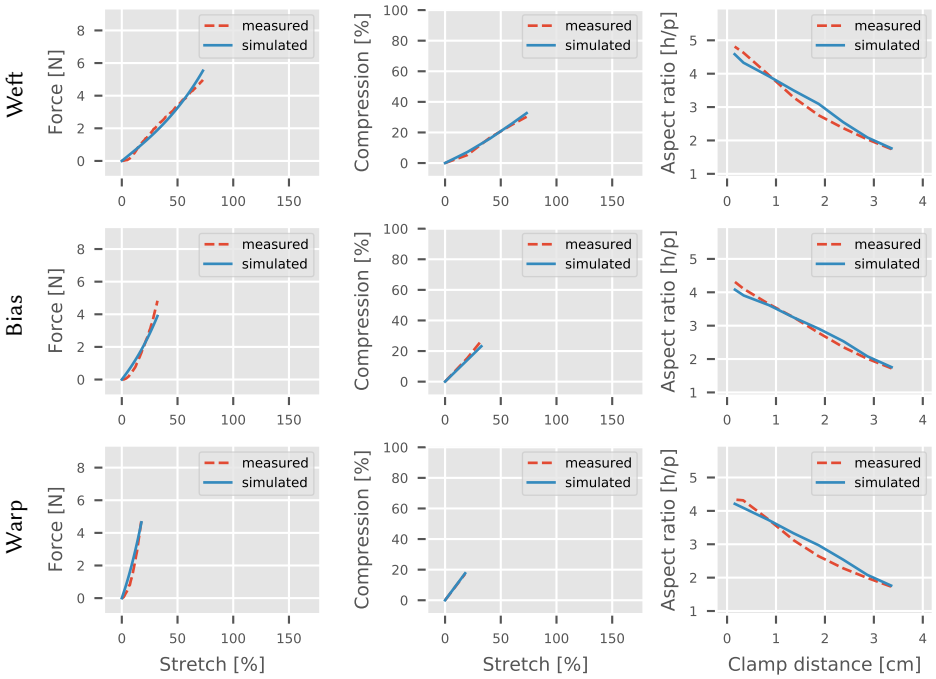
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	1	132	0.49	1.02×0.57	-





Thin-Shell Fit

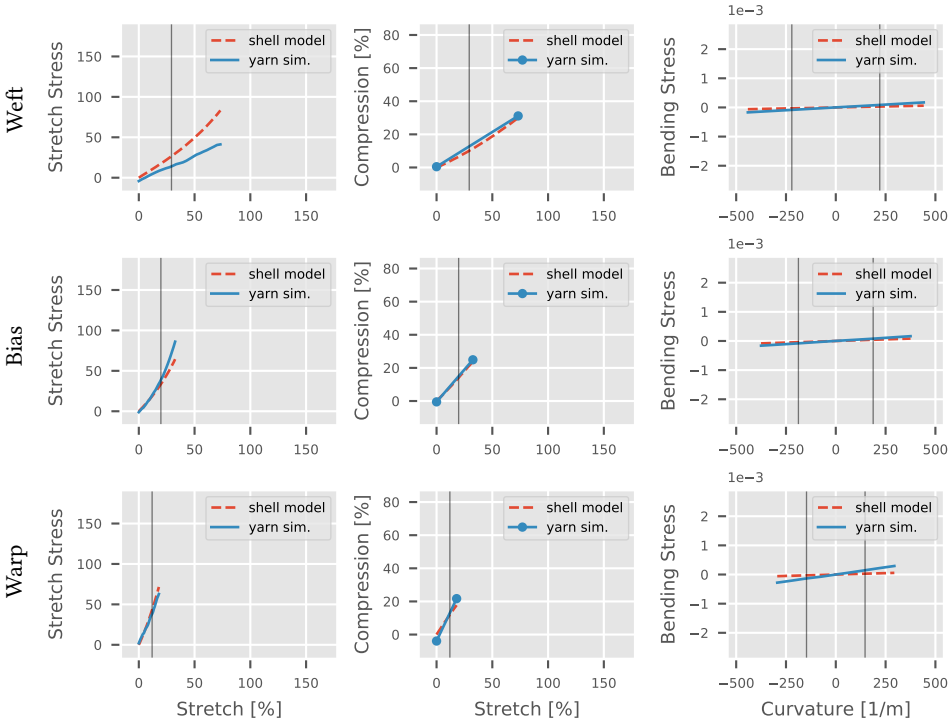
Parameter	Value
k_{xx}	5.93e+01
k_{xy}	6.36e+01
k_{yy}	3.69e+02
k_{ss}	4.19e+01
k_{n1}	1.38e+01
k_{n2}	1.98e+01
$k_{\theta,weft}$	9.59e-08
$k_{\theta,bias}$	1.10e-07
$k_{\theta,warp}$	6.78e-08



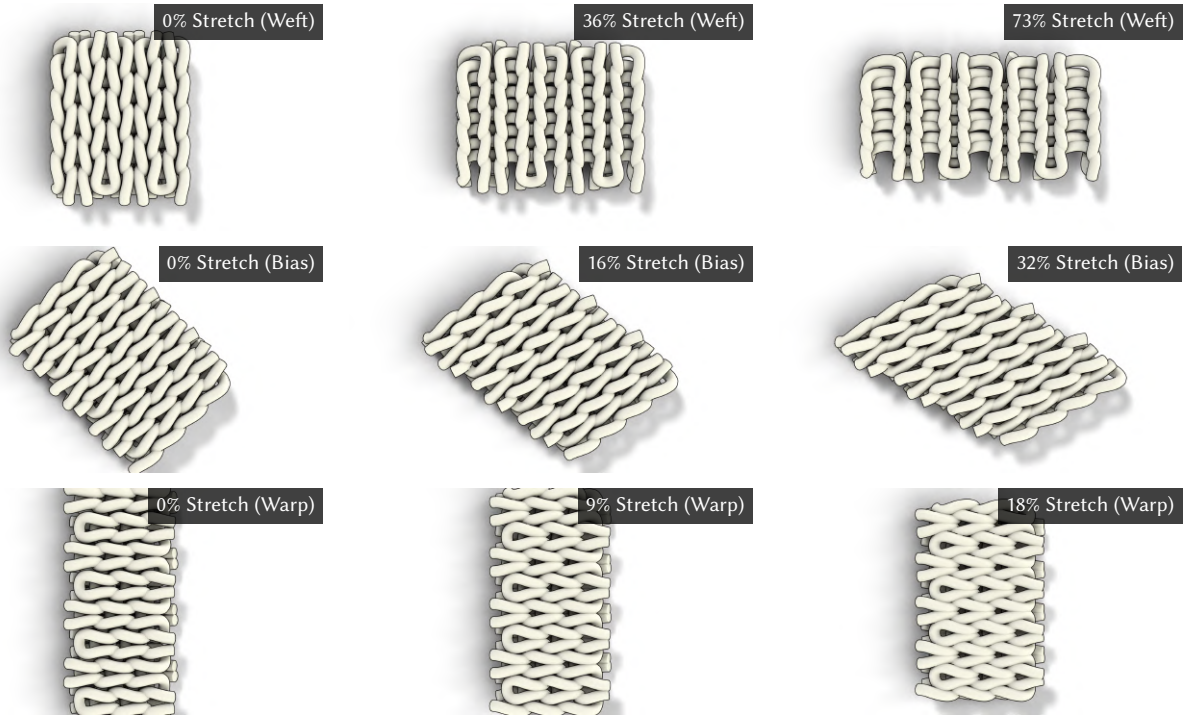
Yarn-Level Fit

Fitting error	%
Comfort Stretch	10
Full Stretch	26
Compression	12
Bending Stiffness	450

Parameter	Value
k_{s1}	3.01e-01
$\bar{\varepsilon}_s$	9.04e-02
k_b	7.57e-10
R_1	1.74e-04
k_{c1}	1.35e+00
k_{s2}	1.03e+01
R_2	2.92e-05
k_{c2}	1.00e+03
R_{visual}	1.05e-04

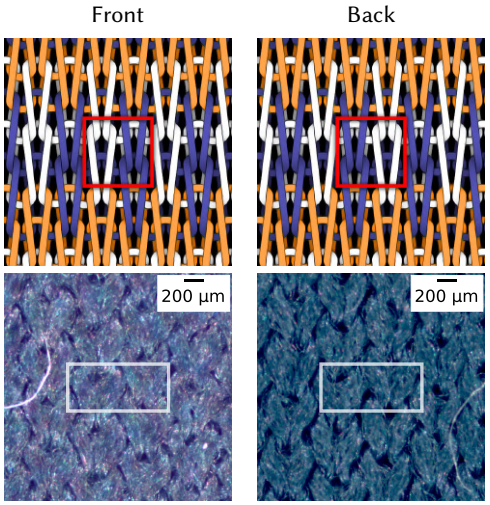


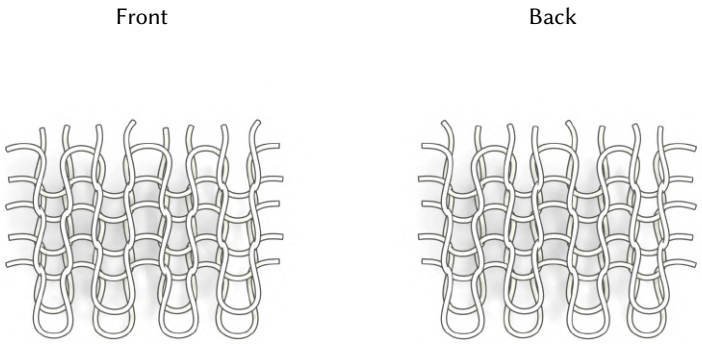
Yarn-Level Simulations



DKIN4: DOUBLE KNIT INTERLOCK

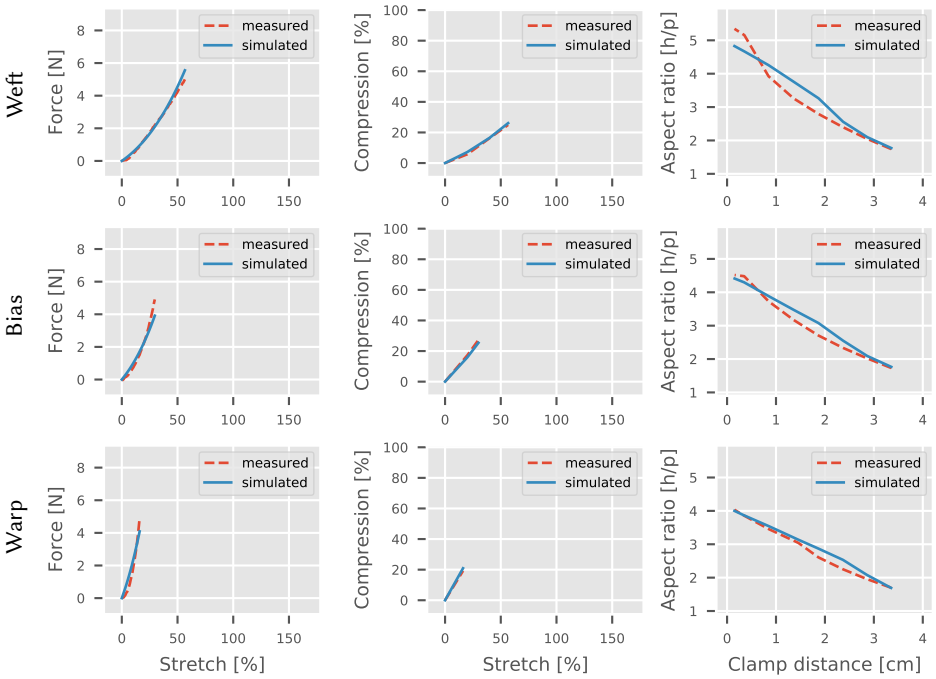
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	1	132	0.36	1.06×0.49	Print





Thin-Shell Fit

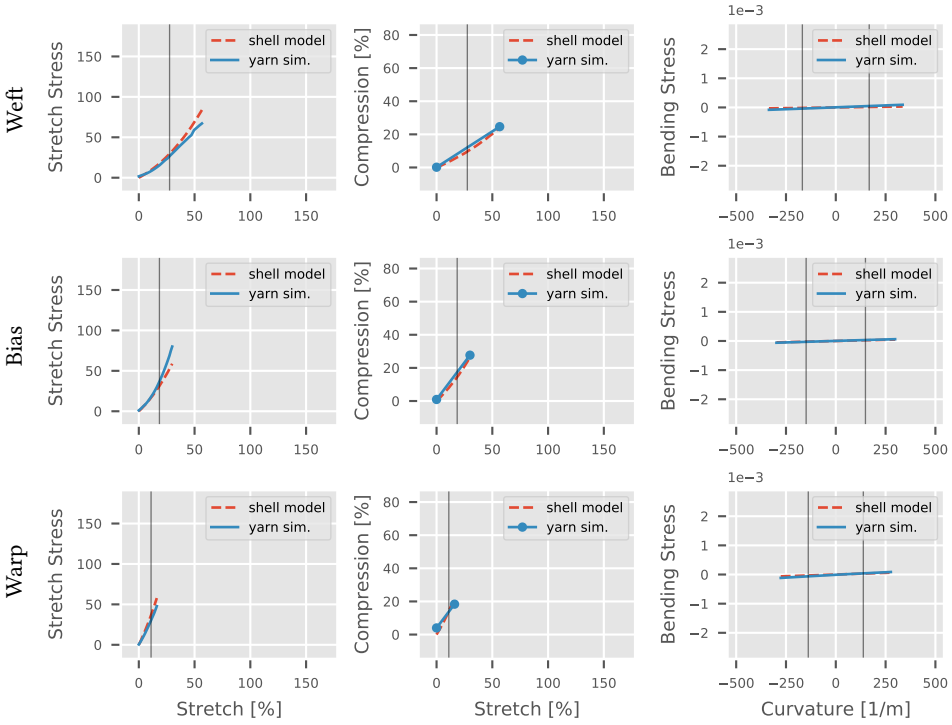
Parameter	Value
k_{xx}	1.10e+02
k_{xy}	1.25e+02
k_{yy}	4.26e+02
k_{ss}	3.94e+01
k_{n1}	0
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.15e-07
$k_{\theta,bias}$	8.02e-08
$k_{\theta,warp}$	4.58e-08



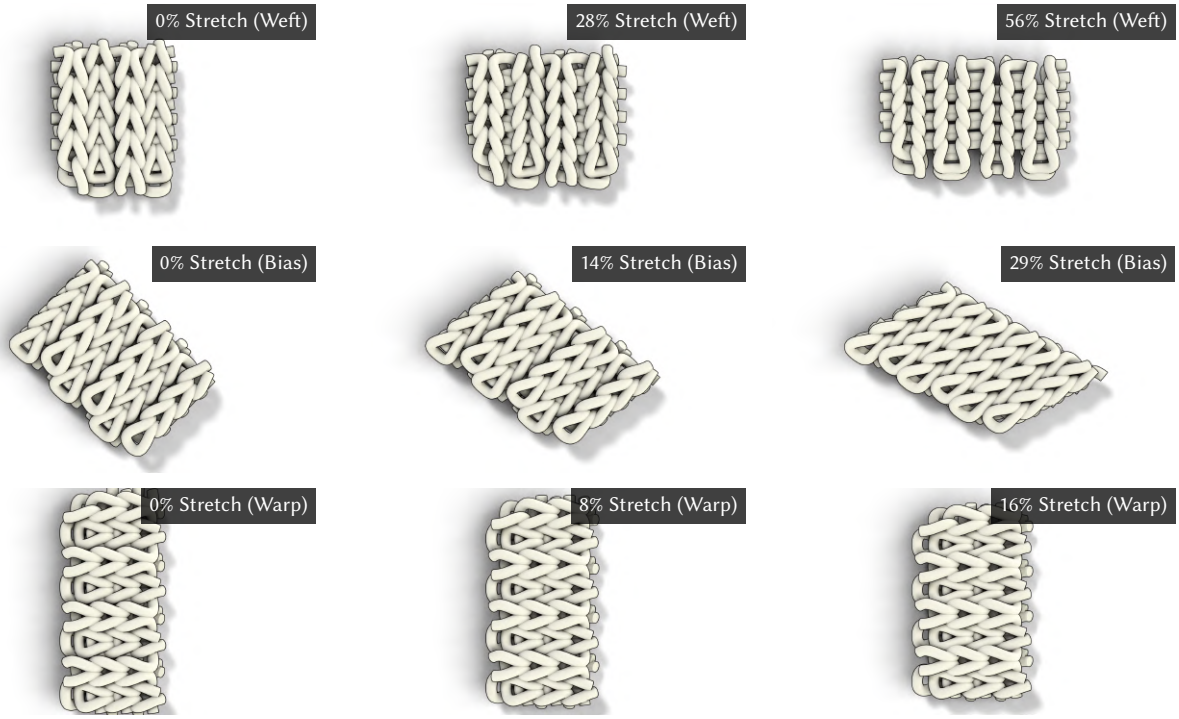
Yarn-Level Fit

Fitting error	%
Comfort Stretch	7
Full Stretch	19
Compression	15
Bending Stiffness	170

Parameter	Value
k_{s1}	1.03e-02
$\bar{\varepsilon}_s$	2.95e-02
k_b	7.22e-10
R_1	6.81e-05
k_{c1}	9.21e+01
k_{s2}	1.03e+01
R_2	2.44e-05
k_{c2}	1.00e+03
R_{visual}	1.04e-04

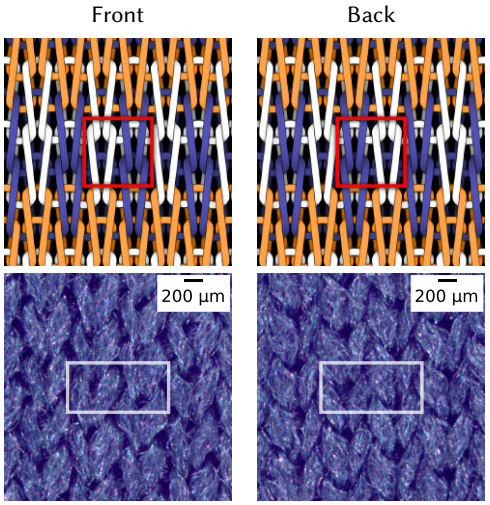


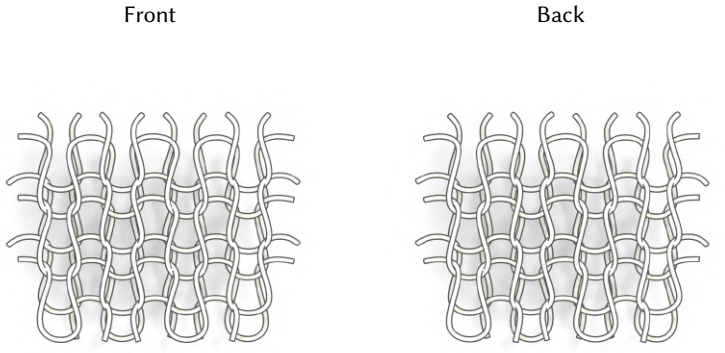
Yarn-Level Simulations



DKIN5: DOUBLE KNIT INTERLOCK

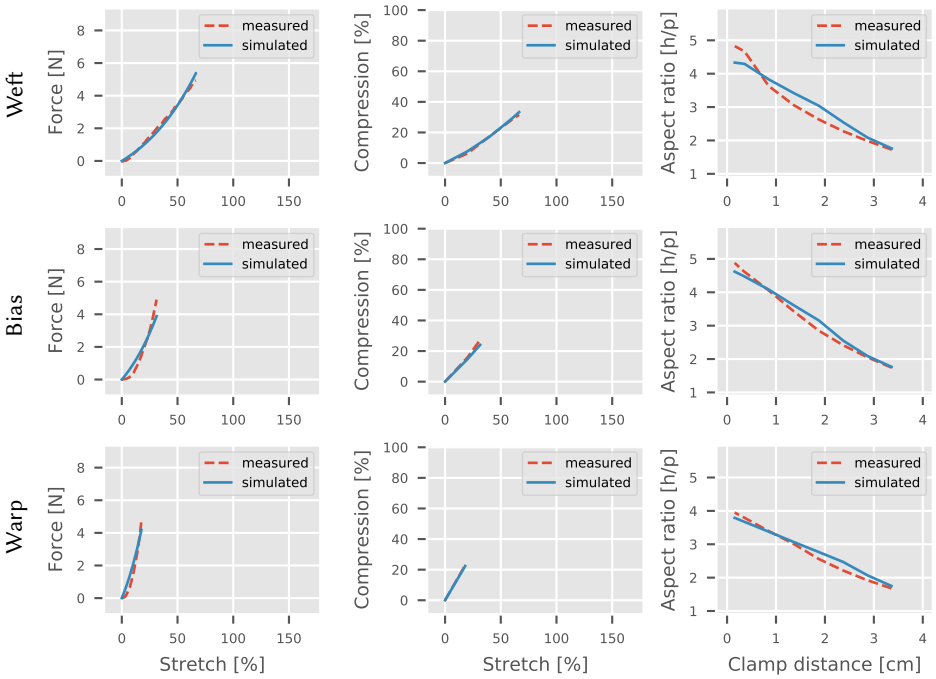
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	1	132	0.44	1.08×0.53	Anti-microbial





Thin-Shell Fit

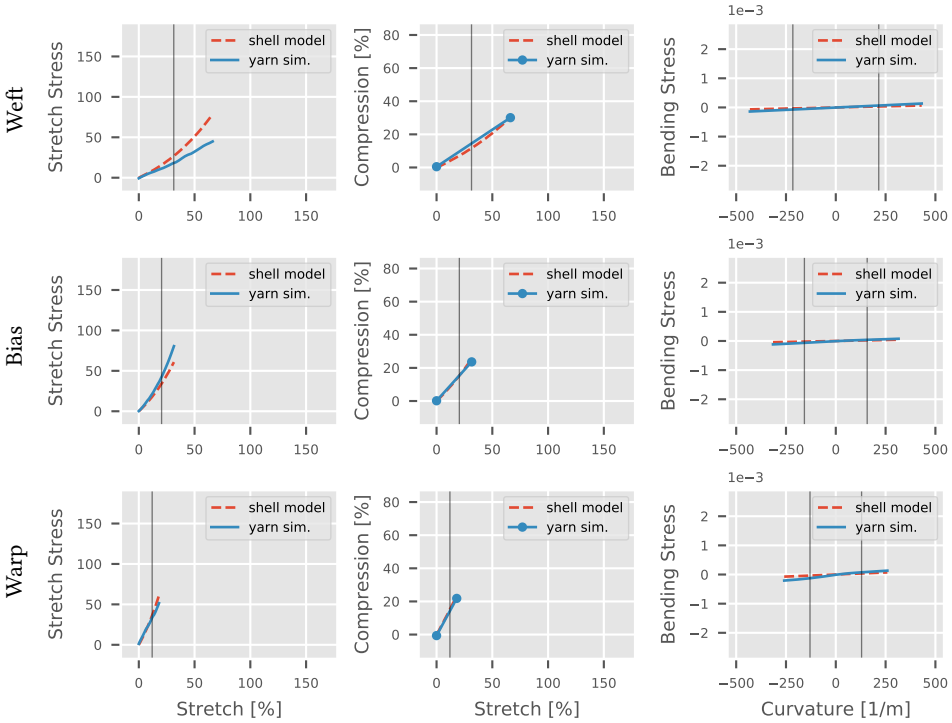
Parameter	Value
k_{xx}	8.20e+01
k_{xy}	1.02e+02
k_{yy}	3.76e+02
k_{ss}	3.91e+01
k_{n1}	3.84e+00
k_{n2}	6.04e+00
$k_{\theta,weft}$	1.40e-07
$k_{\theta,bias}$	6.62e-08
$k_{\theta,warp}$	7.68e-08



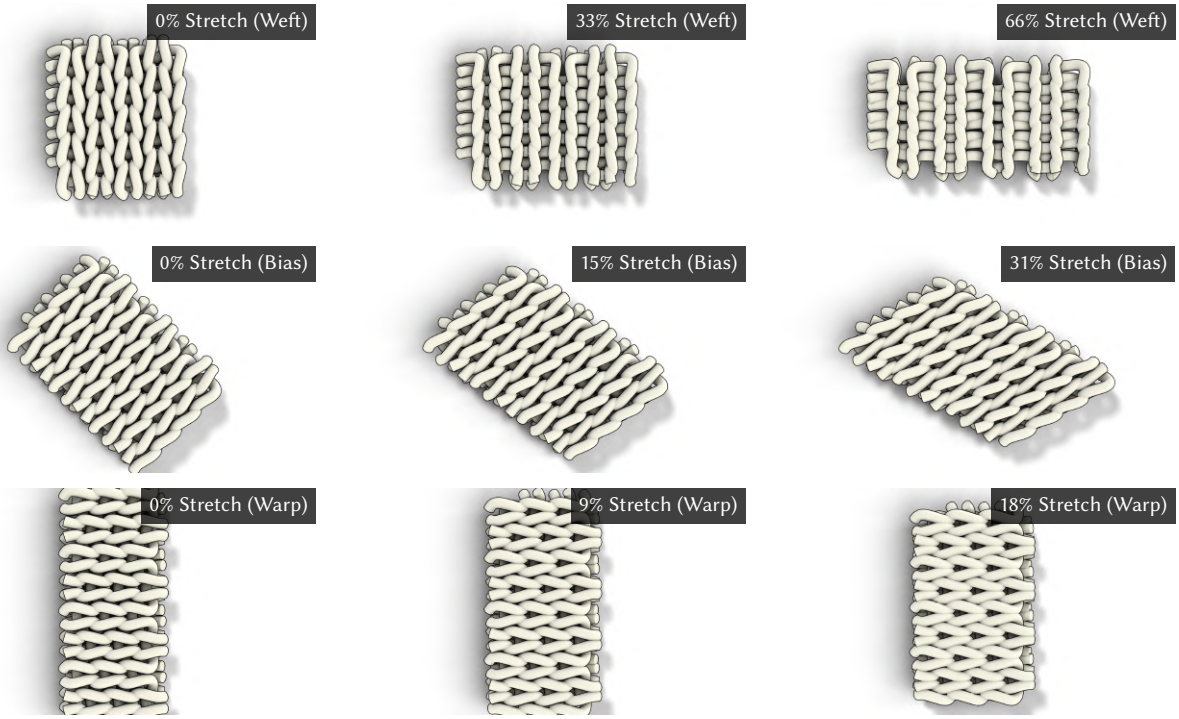
Yarn-Level Fit

Fitting error	%
Comfort Stretch	9
Full Stretch	26
Compression	7
Bending Stiffness	273

Parameter	Value
k_{s1}	3.15e-01
$\bar{\varepsilon}_s$	7.94e-02
k_b	5.77e-10
R_1	1.55e-04
k_{c1}	1.69e+00
k_{s2}	1.03e+01
R_2	2.84e-05
k_{c2}	1.00e+03
R_{visual}	1.02e-04

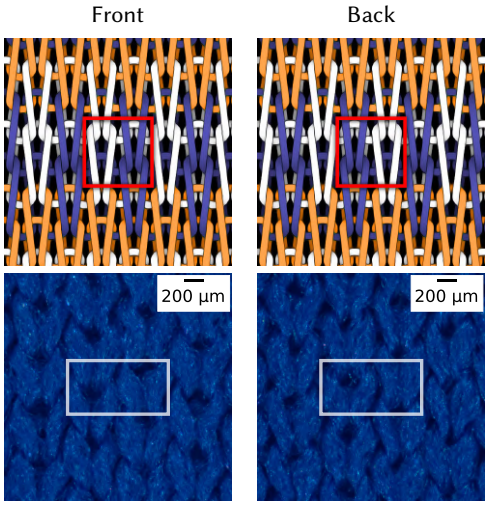


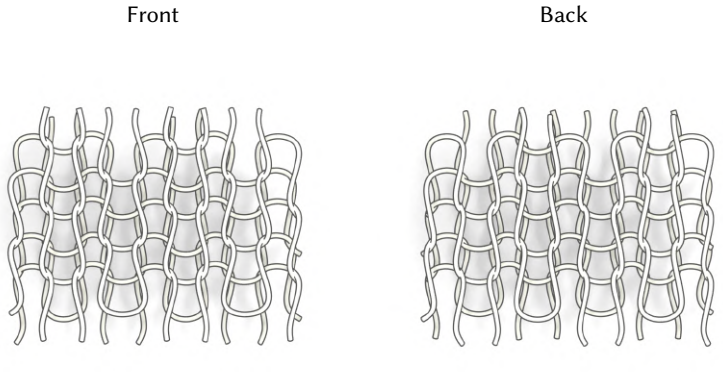
Yarn-Level Simulations



DKIN6: DOUBLE KNIT INTERLOCK

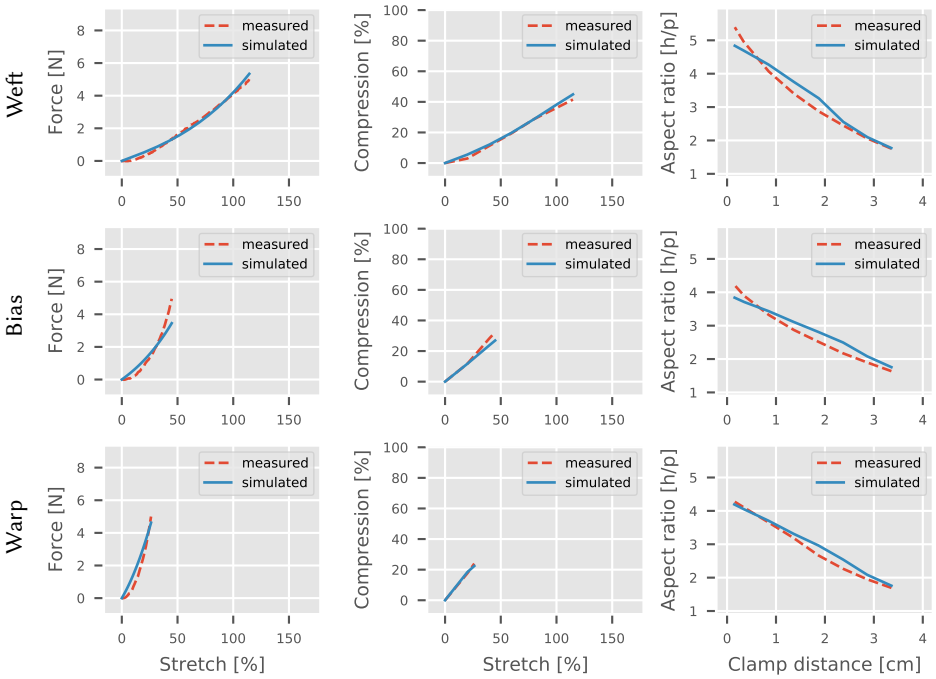
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F CD Polyester	100	1	128	0.44	1.02×0.54	Anti-microbial





Thin-Shell Fit

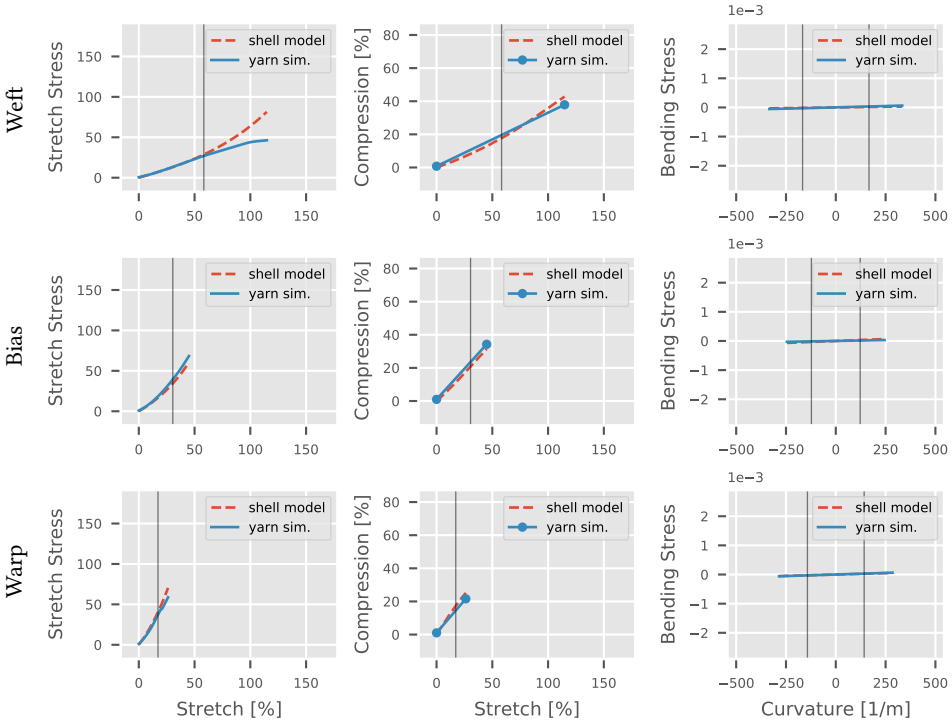
Parameter	Value
k_{xx}	2.55e+01
k_{xy}	2.84e+01
k_{yy}	2.12e+02
k_{ss}	2.54e+01
k_{n1}	4.72e+00
k_{n2}	9.57e+00
$k_{\theta,weft}$	9.67e-08
$k_{\theta,bias}$	1.35e-07
$k_{\theta,warp}$	4.41e-08



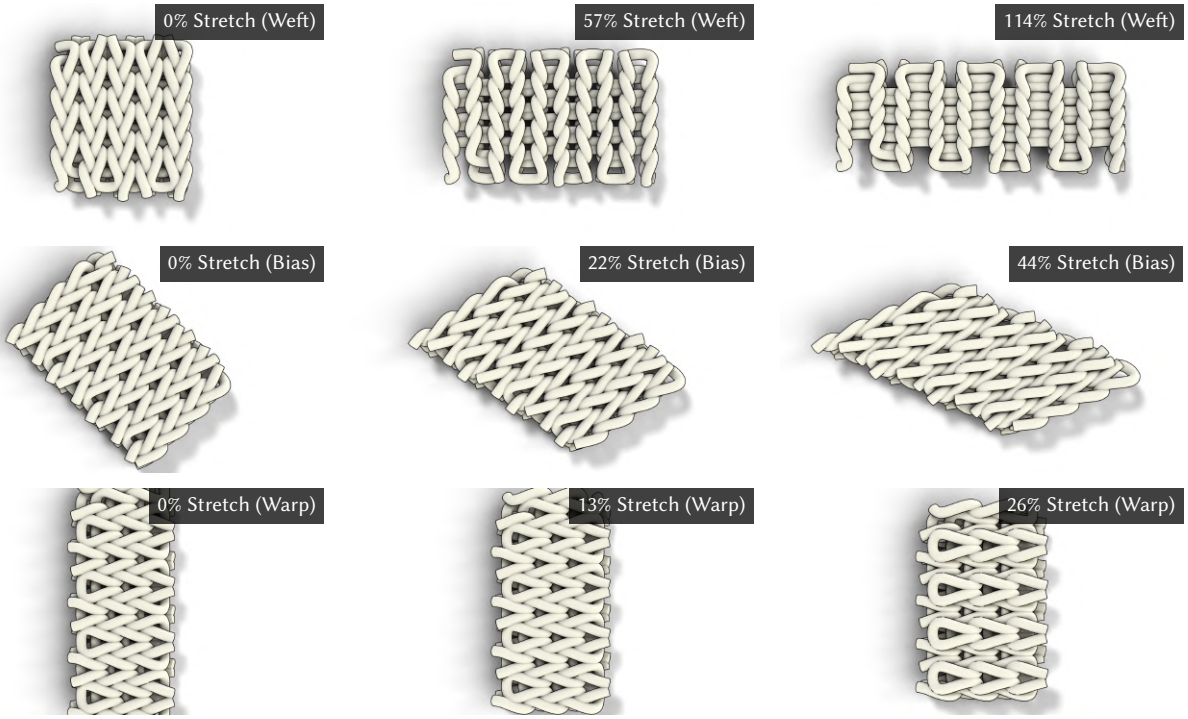
Yarn-Level Fit

Fitting error	%
Comfort Stretch	4
Full Stretch	17
Compression	11
Bending Stiffness	64

Parameter	Value
k_{s1}	1.34e-01
$\bar{\varepsilon}_s$	1.22e-01
k_b	3.92e-10
R_1	7.30e-05
k_{c1}	1.00e+02
k_{s2}	1.24e+01
R_2	2.92e-05
k_{c2}	1.00e+03
R_{visual}	9.99e-05

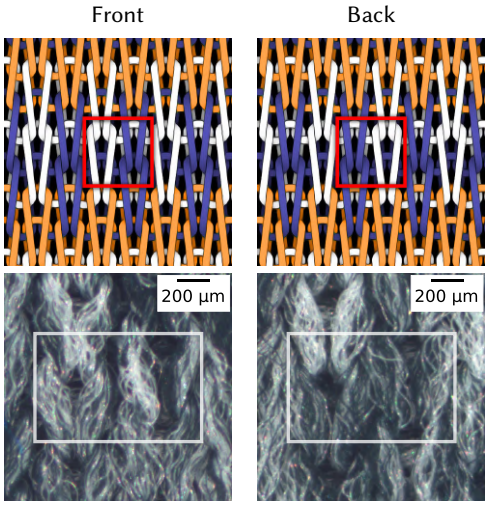


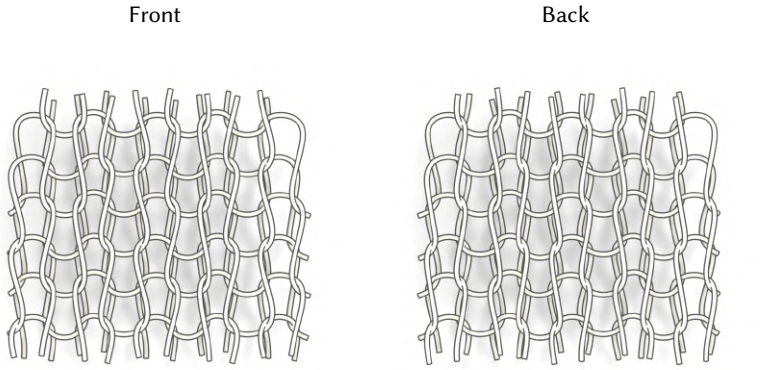
Yarn-Level Simulations



DKIN7: DOUBLE KNIT INTERLOCK

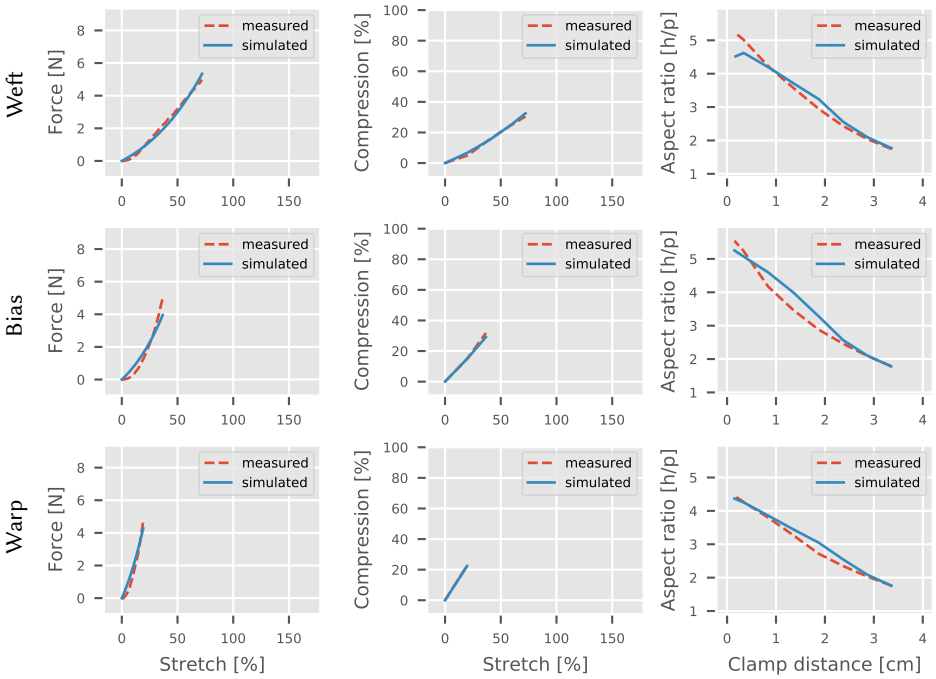
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F CD	100	1	127	0.42	1.04×0.67	Anti-microbial





Thin-Shell Fit

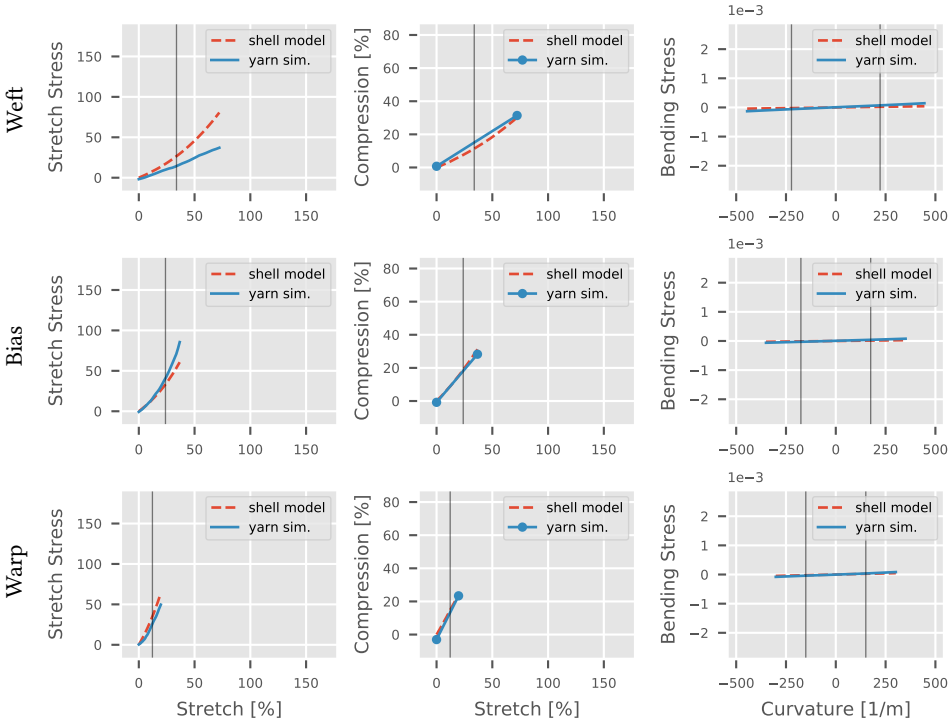
Parameter	Value
k_{xx}	6.68e+01
k_{xy}	7.82e+01
k_{yy}	3.28e+02
k_{ss}	3.07e+01
k_{n1}	3.40e+00
k_{n2}	5.40e+00
$k_{\theta,weft}$	7.88e-08
$k_{\theta,bias}$	3.87e-08
$k_{\theta,warp}$	4.62e-08



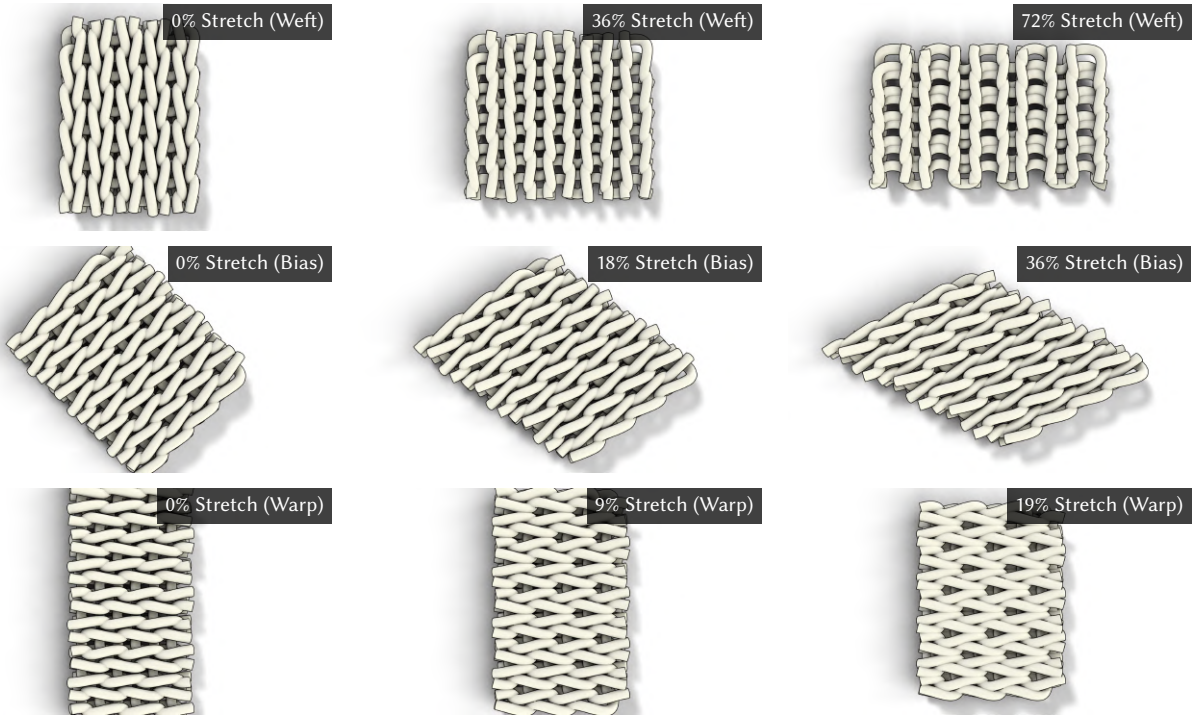
Yarn-Level Fit

Fitting error	%
Comfort Stretch	15
Full Stretch	36
Compression	10
Bending Stiffness	241

Parameter	Value
k_{s1}	1.33e-01
$\bar{\varepsilon}_s$	8.77e-02
k_b	1.46e-09
R_1	1.53e-04
k_{c1}	1.21e+00
k_{s2}	1.11e+01
R_2	3.02e-05
k_{c2}	1.00e+03
R_{visual}	9.71e-05

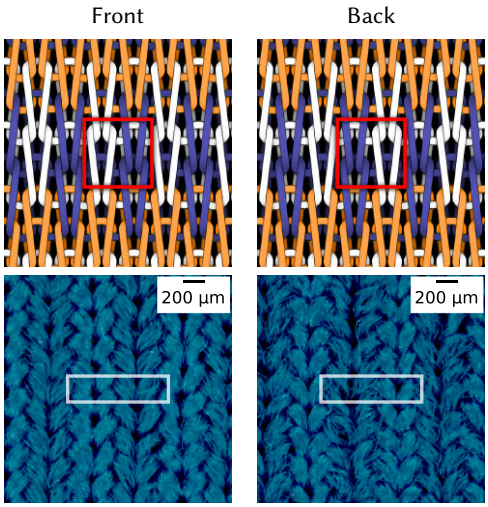


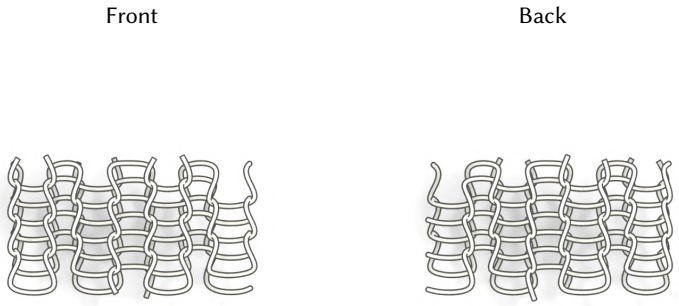
Yarn-Level Simulations



DKIN8: DOUBLE KNIT INTERLOCK

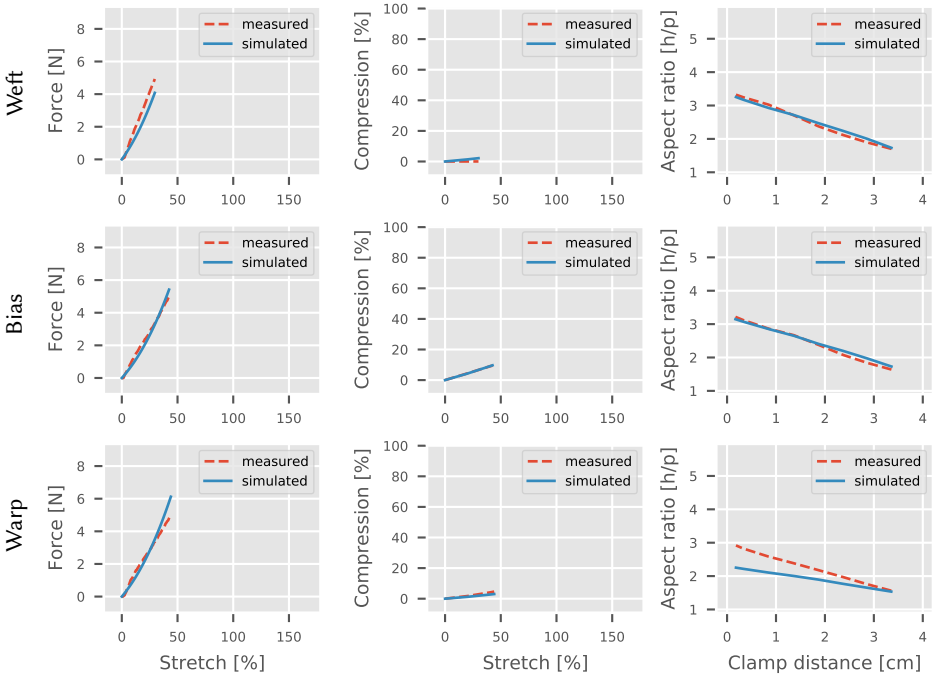
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
50D/72F Polyester	39	1				
50D/36F Polyester Celliant	38	1	267	0.62	0.94 × 0.24	Anti-microbial
40D Spandex	23	1				





Thin-Shell Fit

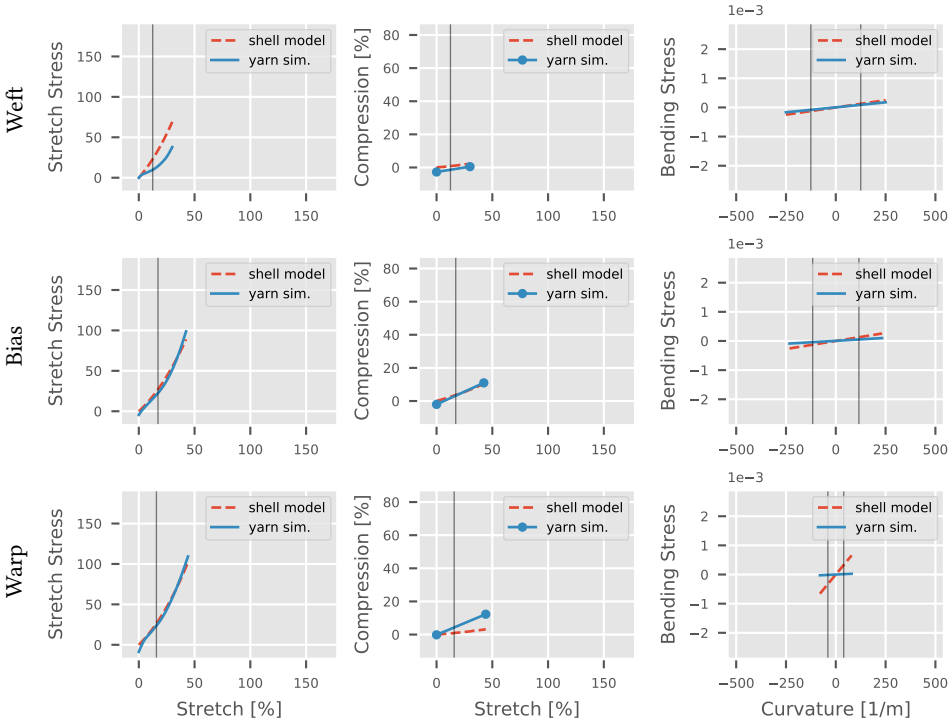
Parameter	Value
k_{xx}	1.49e+02
k_{xy}	0
k_{yy}	1.28e+02
k_{ss}	5.28e+01
k_{n1}	3.97e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	4.13e-06
$k_{\theta,bias}$	5.52e-07
$k_{\theta,warp}$	4.98e-07



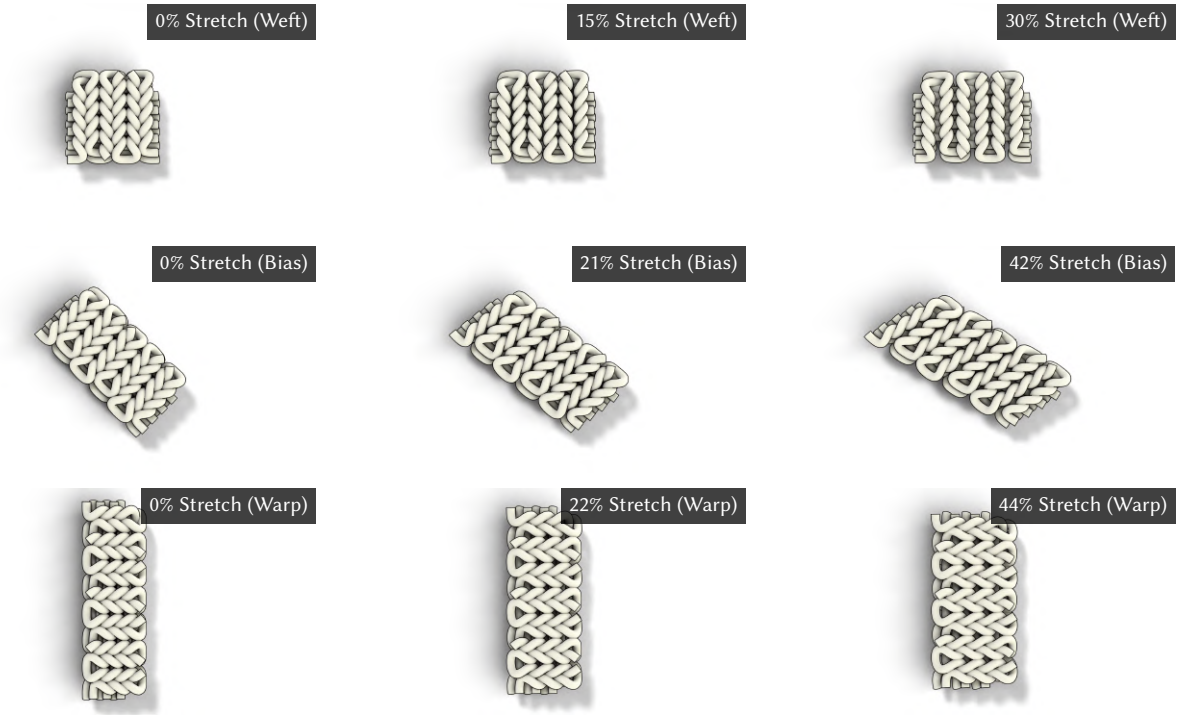
Yarn-Level Fit

Fitting error	%
Comfort Stretch	16
Full Stretch	32
Compression	75
Bending Stiffness	33

Parameter	Value
k_{s1}	3.72e-02
$\bar{\varepsilon}_s$	3.40e-02
k_b	3.36e-10
R_1	6.74e-05
k_{c1}	1.00e+02
k_{s2}	8.33e+00
R_2	2.75e-05
k_{c2}	1.00e+03
R_{visual}	7.77e-05

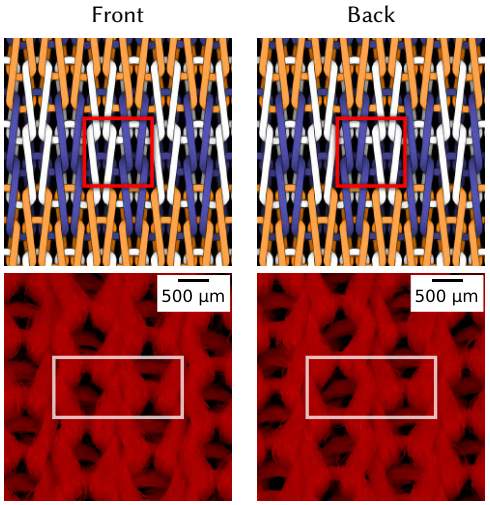


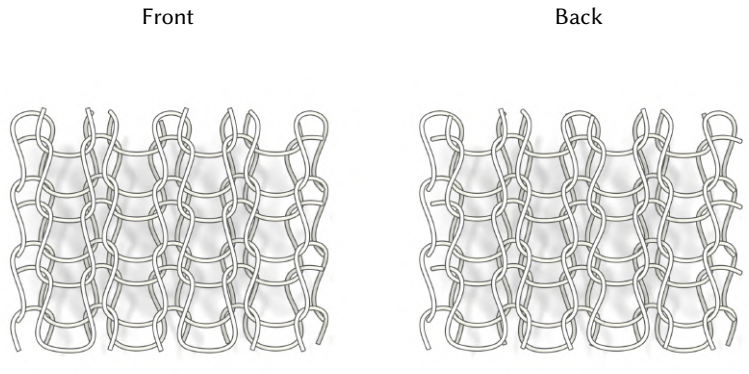
Yarn-Level Simulations



DKIN9: DOUBLE KNIT INTERLOCK

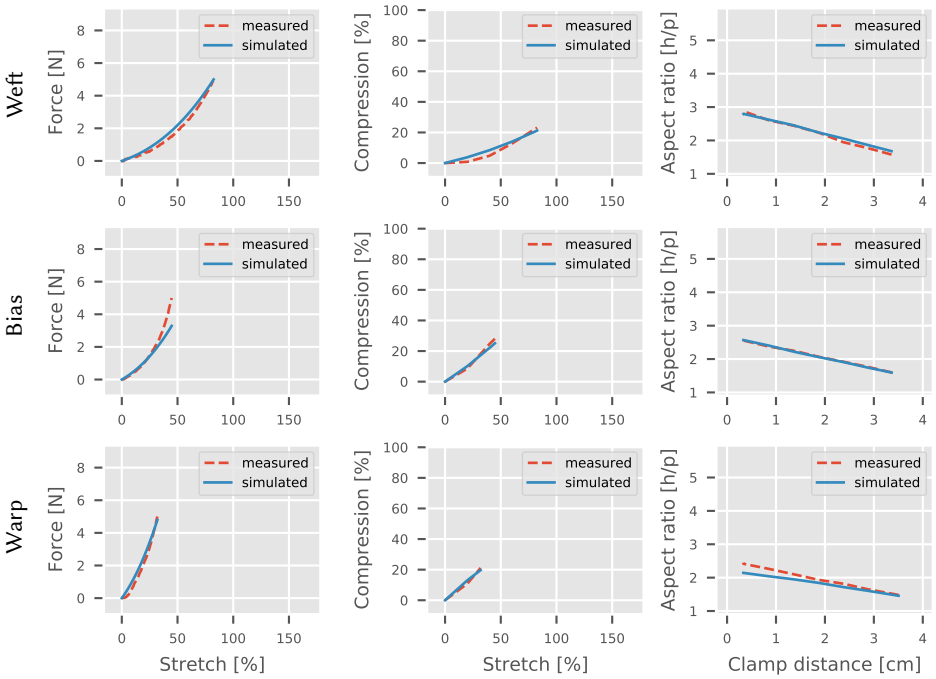
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	2	280	1.01	2.12×0.99	-





Thin-Shell Fit

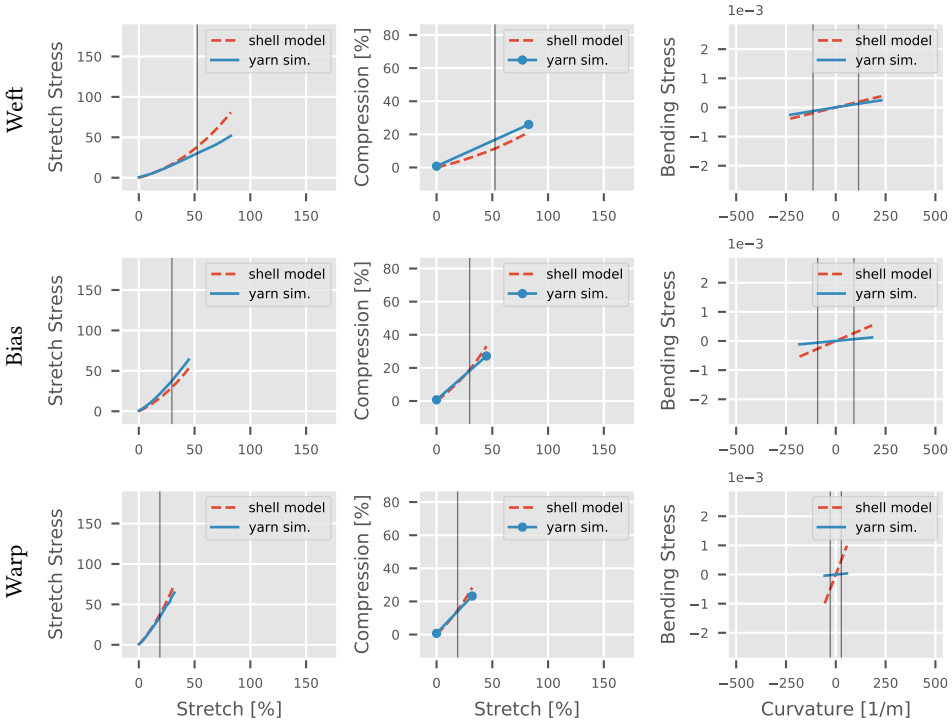
Parameter	Value
k_{xx}	4.25e+01
k_{xy}	2.80e+01
k_{yy}	1.72e+02
k_{ss}	2.22e+01
k_{n1}	0
k_{n2}	1.00e-05
$k_{\theta,weft}$	8.88e-06
$k_{\theta,bias}$	1.47e-06
$k_{\theta,warp}$	8.42e-07



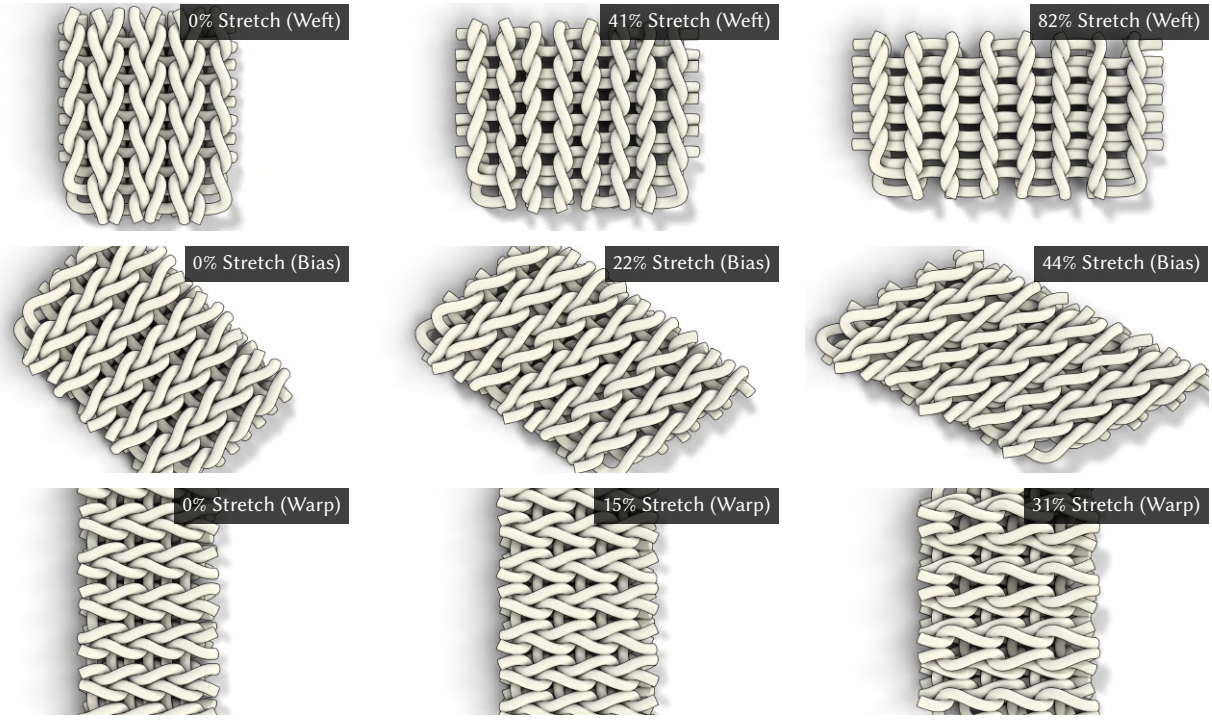
Yarn-Level Fit

Fitting error	%
Comfort Stretch	8
Full Stretch	21
Compression	14
Bending Stiffness	34

Parameter	Value
k_{s1}	2.13e-01
$\bar{\varepsilon}_s$	9.55e-02
k_b	4.72e-09
R_1	1.43e-04
k_{c1}	9.66e+01
k_{s2}	1.85e+01
R_2	5.48e-05
k_{c2}	1.00e+03
R_{visual}	1.49e-04

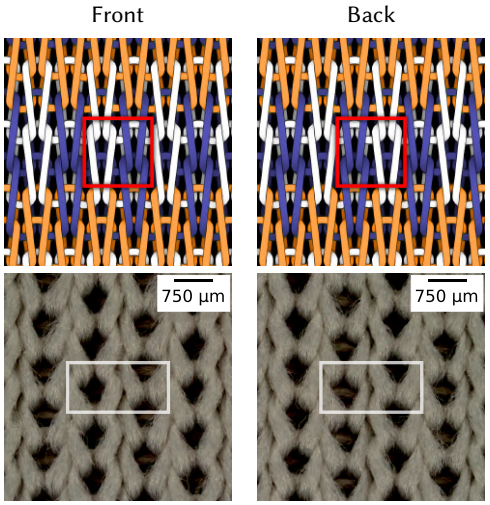


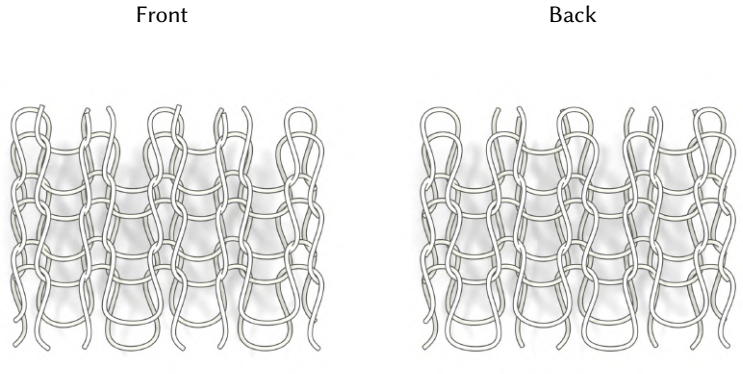
Yarn-Level Simulations



DKIN10: DOUBLE KNIT INTERLOCK

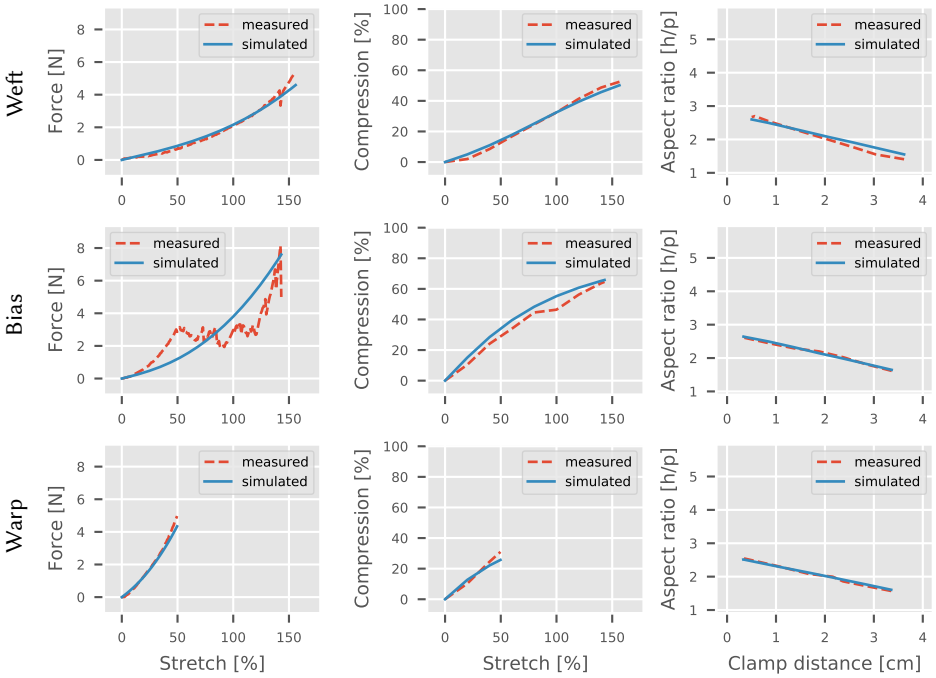
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	3	248	0.78	1.98×0.97	-





Thin-Shell Fit

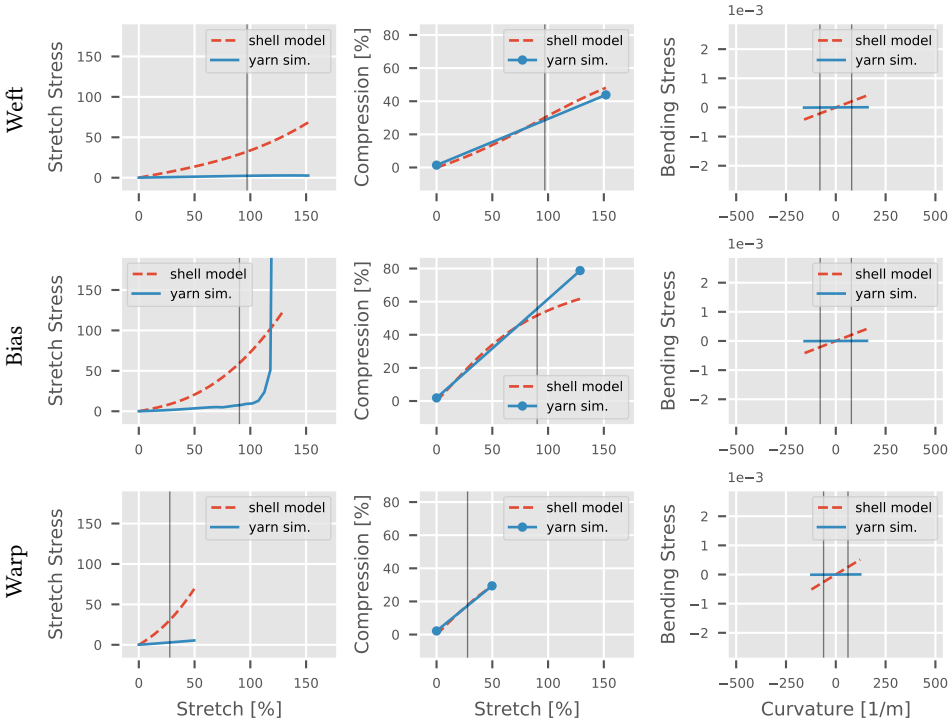
Parameter	Value
k_{xx}	9.73e+00
k_{xy}	0
k_{yy}	7.36e+01
k_{ss}	7.37e+00
k_{n1}	6.53e+00
k_{n2}	3.77e+00
$k_{\theta,weft}$	2.09e-06
$k_{\theta,bias}$	1.33e-06
$k_{\theta,warp}$	1.30e-06



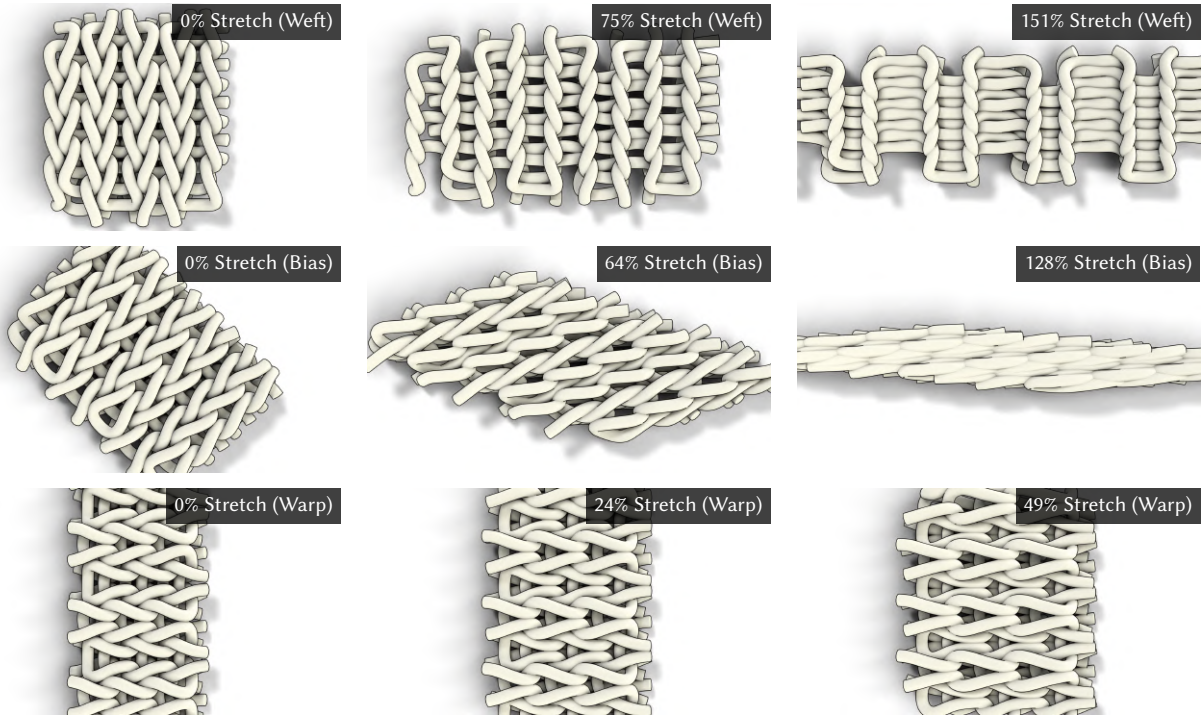
Yarn-Level Fit

Fitting error	%
Comfort Stretch	30
Full Stretch	276
Compression	6
Bending Stiffness	73

Parameter	Value
k_{s1}	1.18e-02
$\bar{\varepsilon}_s$	2.00e-01
k_b	1.41e-10
R_1	1.42e-04
k_{c1}	2.96e+00
k_{s2}	1.03e+01
R_2	3.74e-05
k_{c2}	1.00e+03
R_{visual}	1.57e-04

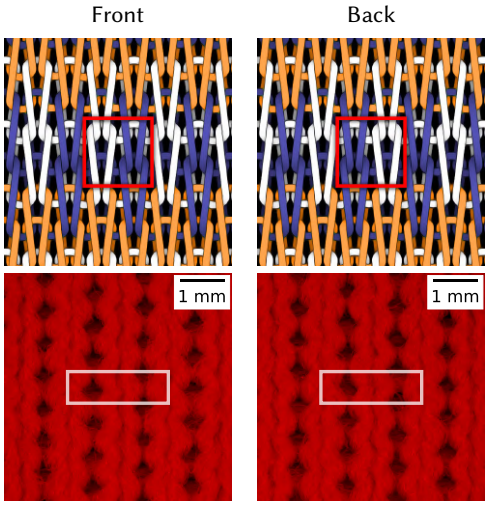


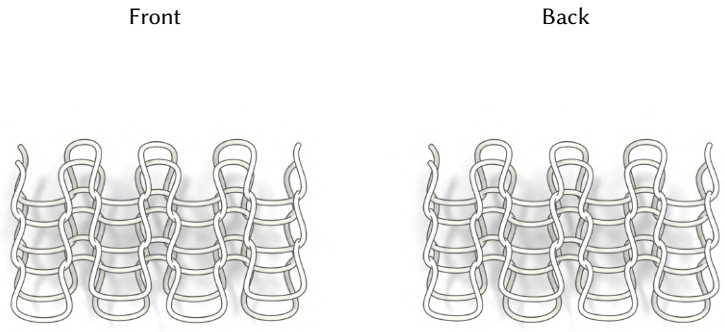
Yarn-Level Simulations



DKIN11: DOUBLE KNIT INTERLOCK

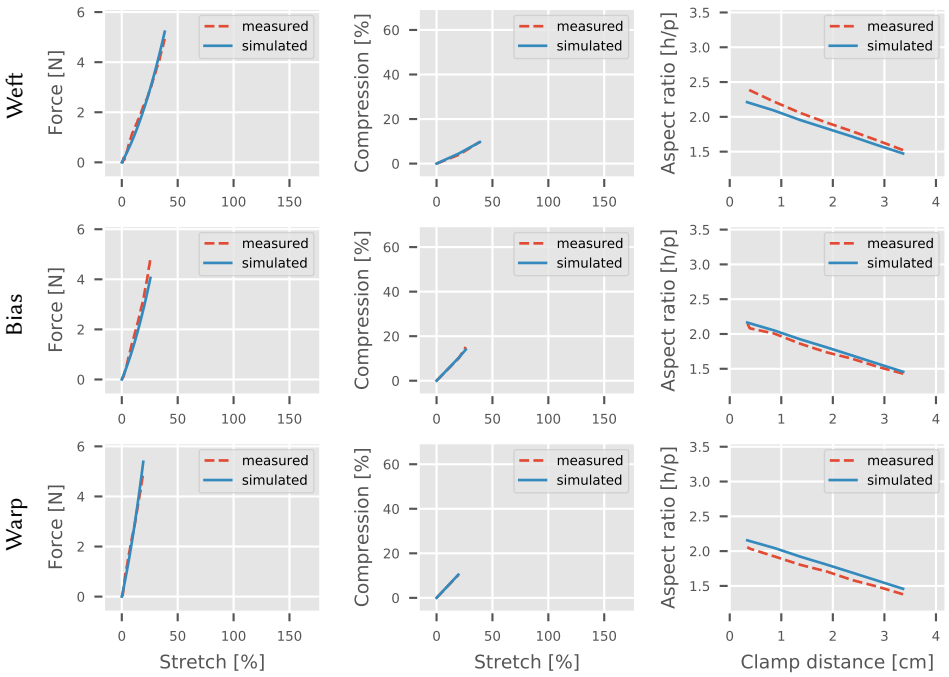
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	2	357	1.20	2.26×0.71	-





Thin-Shell Fit

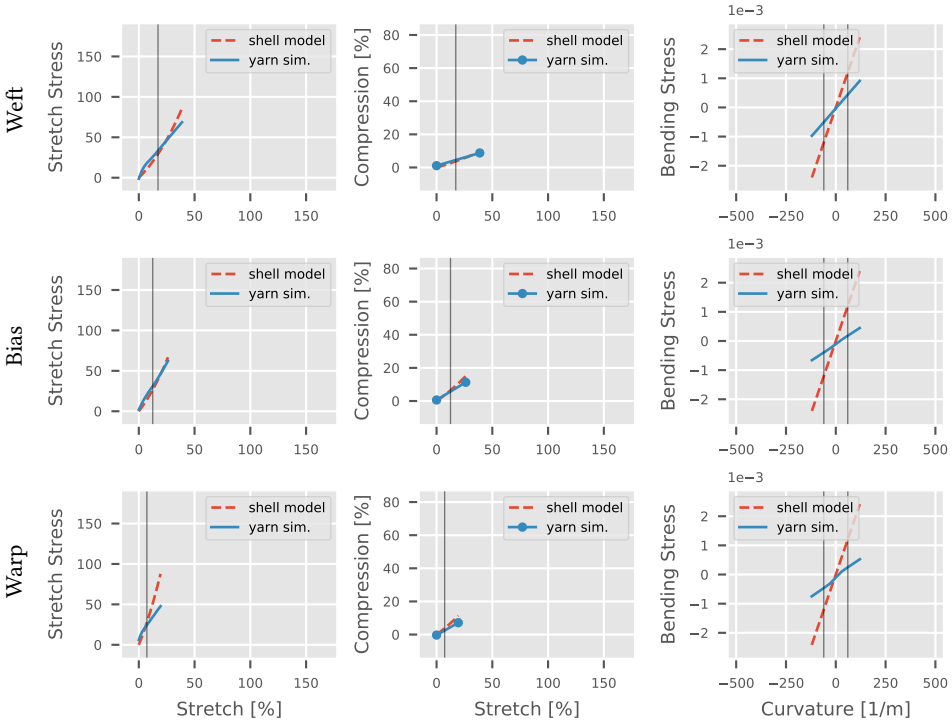
Parameter	Value
k_{xx}	1.48e+02
k_{xy}	7.42e+01
k_{yy}	3.81e+02
k_{ss}	6.08e+01
k_{n1}	0
k_{n2}	1.00e-05
$k_{\theta,weft}$	8.25e-06
$k_{\theta,bias}$	8.01e-06
$k_{\theta,warp}$	5.82e-06



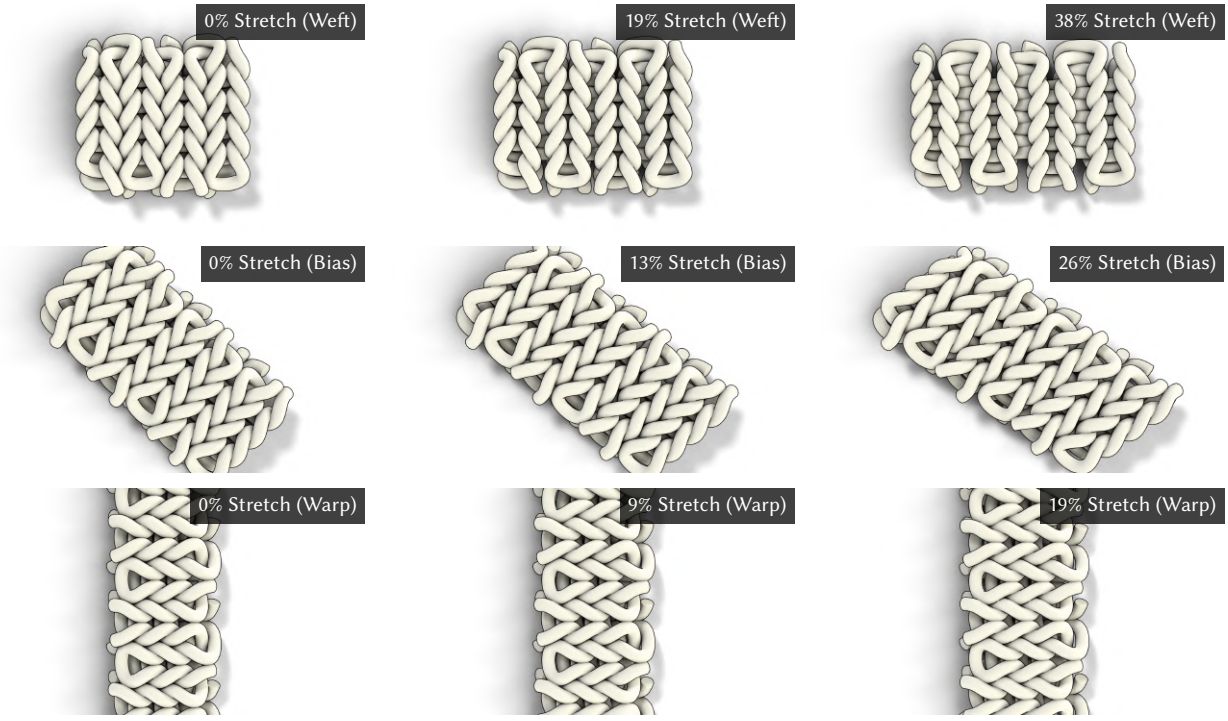
Yarn-Level Fit

Fitting error	%
Comfort Stretch	16
Full Stretch	32
Compression	26
Bending Stiffness	38

Parameter	Value
k_{s1}	1.99e-02
$\bar{\varepsilon}_s$	8.27e-02
k_b	7.56e-09
R_1	1.86e-04
k_{c1}	5.88e+01
k_{s2}	1.85e+01
R_2	5.66e-05
k_{c2}	1.00e+03
R_{visual}	1.85e-04

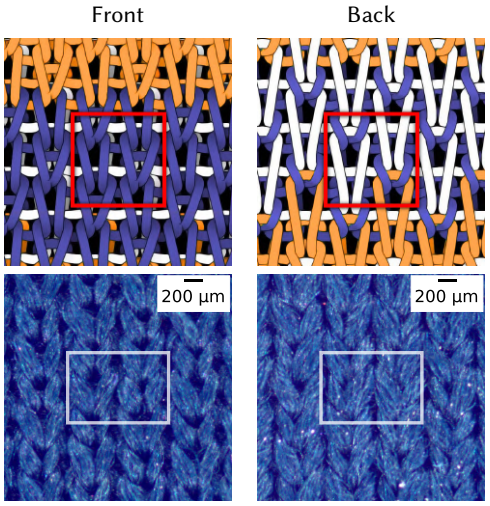


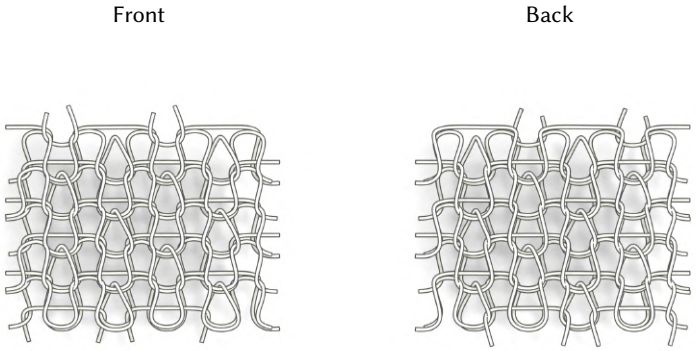
Yarn-Level Simulations



DKP: DOUBLE KNIT PIQUE

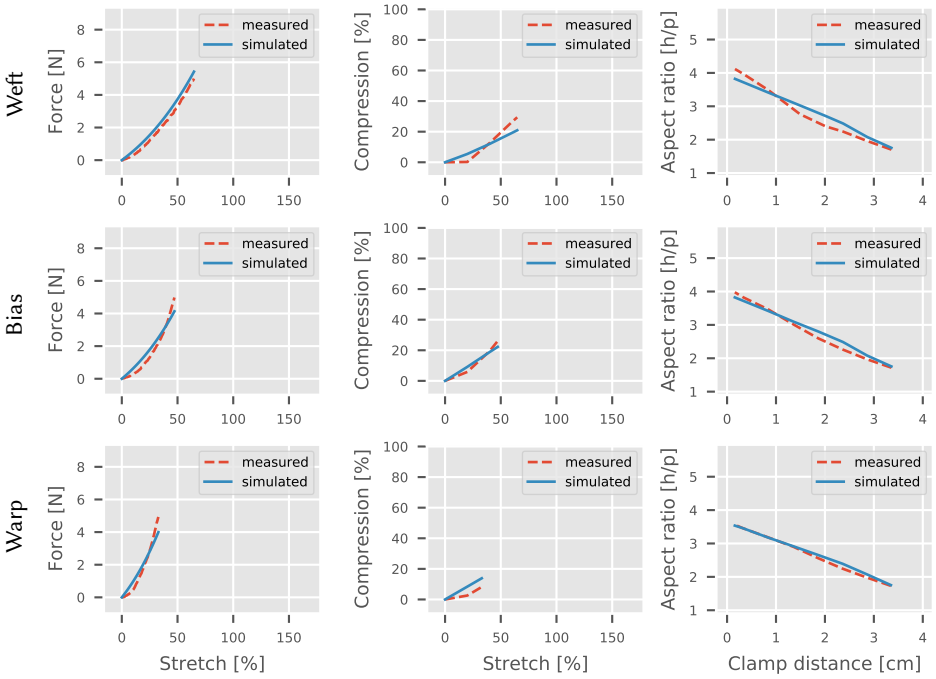
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	96	1	185	0.52	1.09 × 0.75	Anti-microbial
20D Spandex	4	1				





Thin-Shell Fit

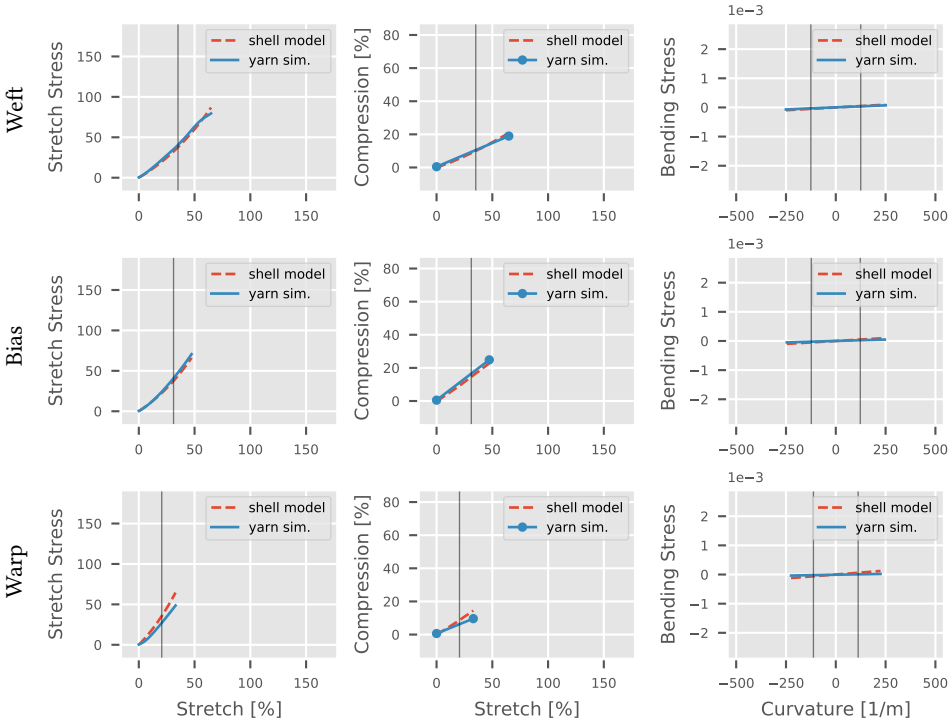
Parameter	Value
k_{xx}	5.55e+01
k_{xy}	0
k_{yy}	1.19e+02
k_{ss}	3.27e+01
k_{n1}	1.73e+01
k_{n2}	1.00e-05
$k_{\theta,weft}$	2.69e-07
$k_{\theta,bias}$	2.02e-07
$k_{\theta,warp}$	1.91e-07



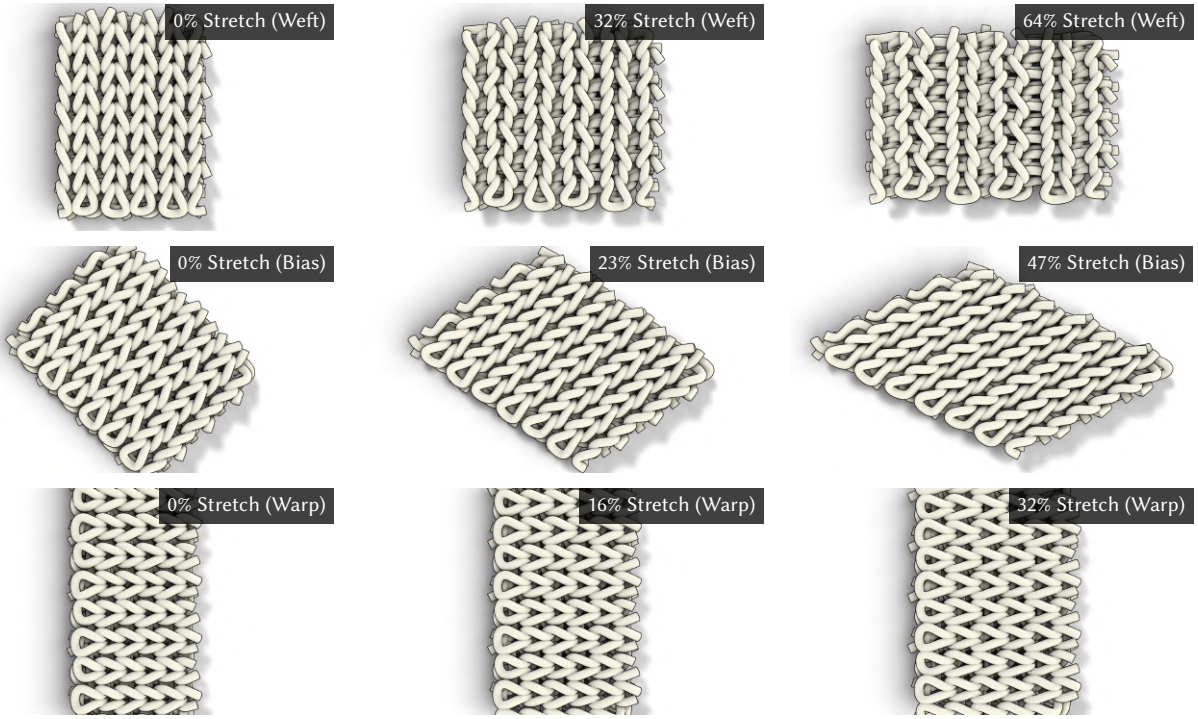
Yarn-Level Fit

Fitting error	%
Comfort Stretch	7
Full Stretch	12
Compression	11
Bending Stiffness	30

Parameter	Value
k_{s1}	7.72e-02
$\bar{\varepsilon}_s$	1.44e-01
k_b	6.20e-10
R_1	6.22e-05
k_{c1}	1.00e+02
k_{s2}	1.03e+01
R_2	3.09e-05
k_{c2}	1.00e+03
R_{visual}	8.87e-05

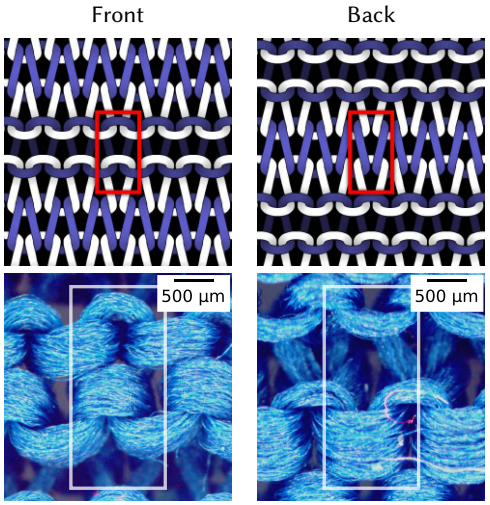


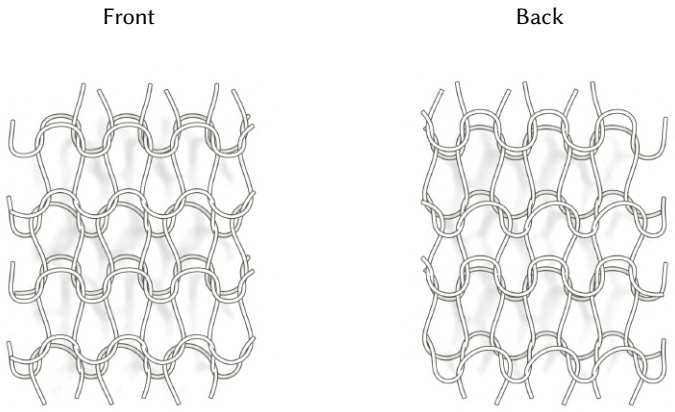
Yarn-Level Simulations



L1: LINKS

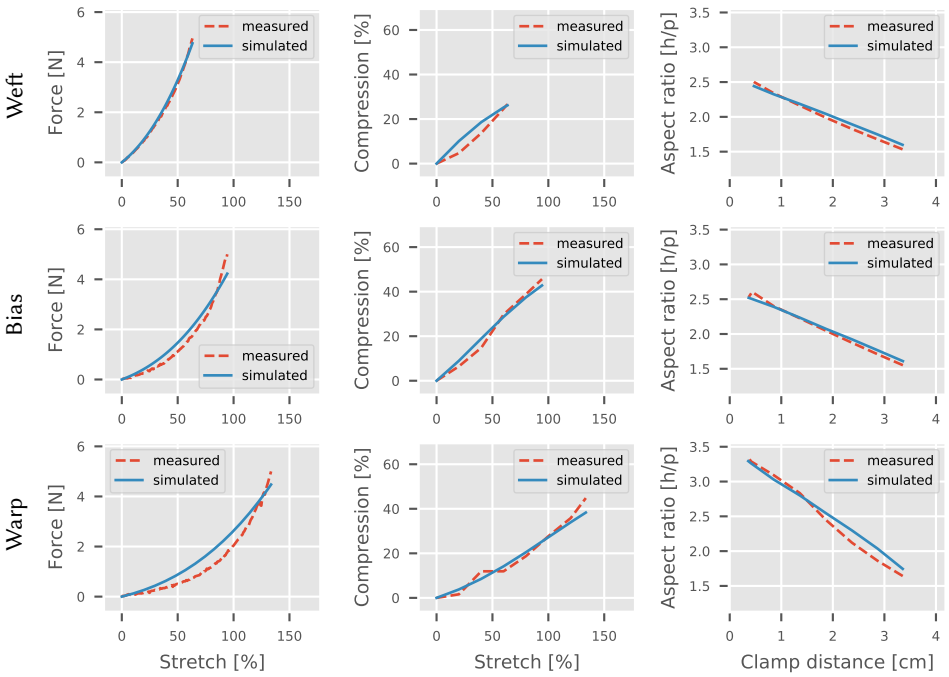
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	3	317	1.00	1.19 × 2.55	-





Thin-Shell Fit

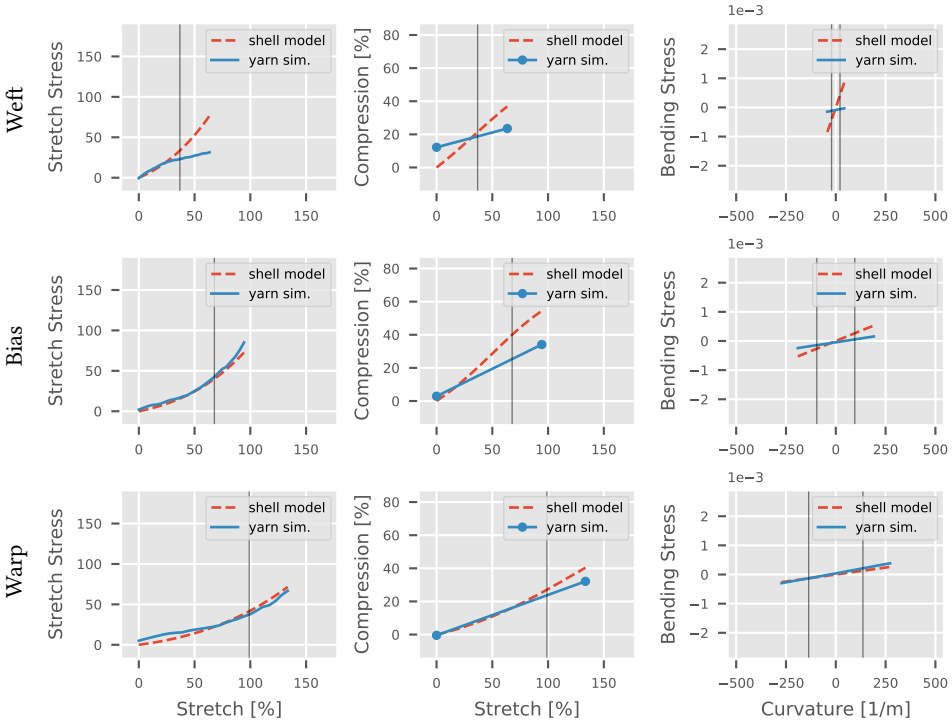
Parameter	Value
k_{xx}	5.77e+01
k_{xy}	4.53e+00
k_{yy}	1.42e+01
k_{ss}	9.76e+00
k_{n1}	2.76e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	5.06e-07
$k_{\theta,bias}$	2.29e-06
$k_{\theta,warp}$	3.54e-06



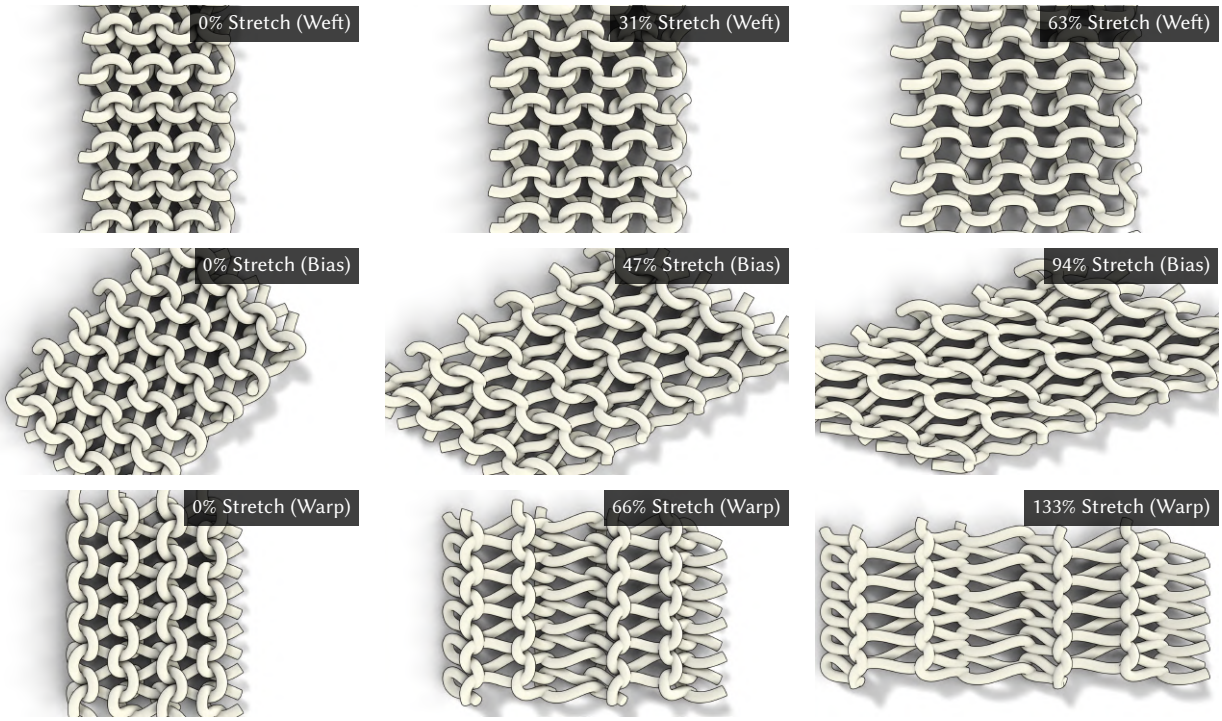
Yarn-Level Fit

Fitting error	%
Comfort Stretch	8
Full Stretch	22
Compression	19
Bending Stiffness	32

Parameter	Value
k_{s1}	2.52e-01
$\bar{\varepsilon}_s$	1.48e-01
k_b	7.56e-09
R_1	2.66e-04
k_{c1}	1.17e+01
k_{s2}	1.85e+01
R_2	6.73e-05
k_{c2}	1.00e+03
R_{visual}	1.62e-04

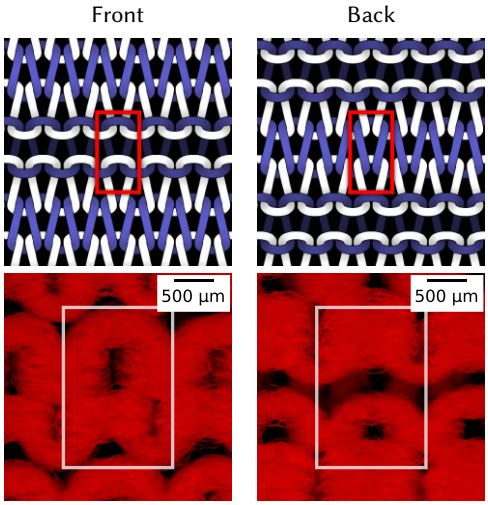


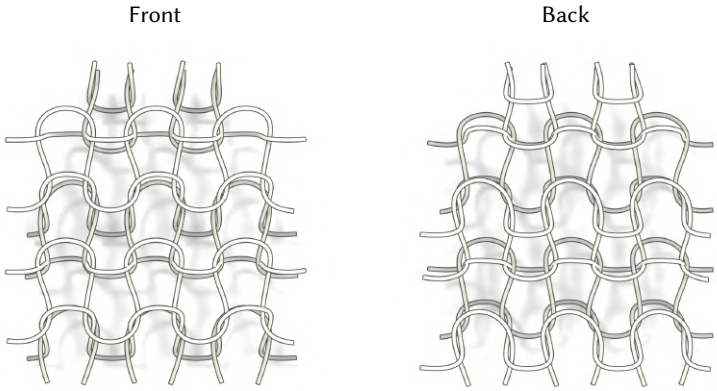
Yarn-Level Simulations



L2: LINKS

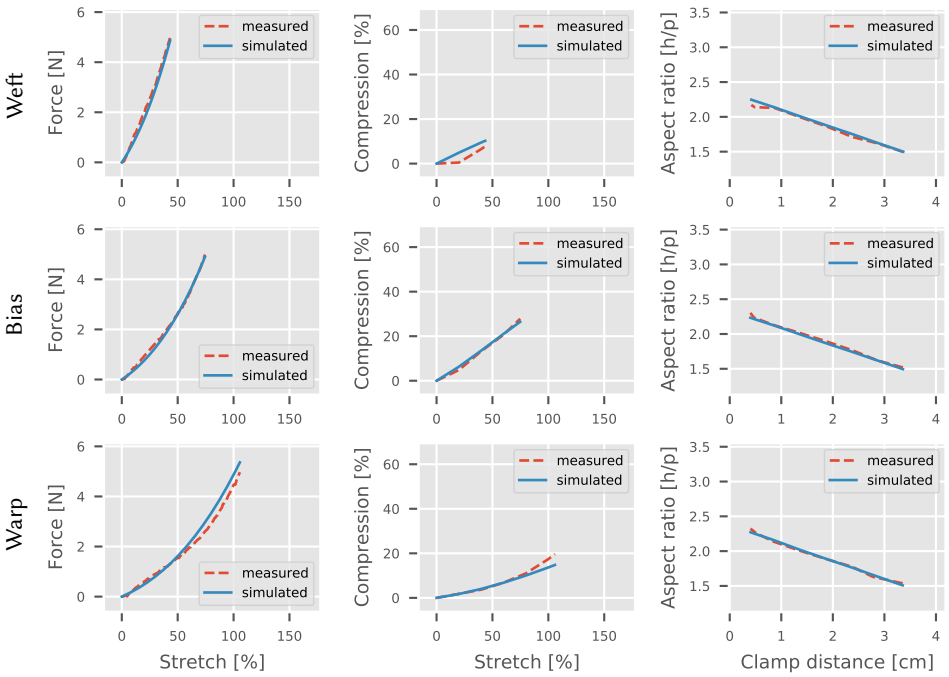
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	3	372	1.70	1.39 × 2.04	-





Thin-Shell Fit

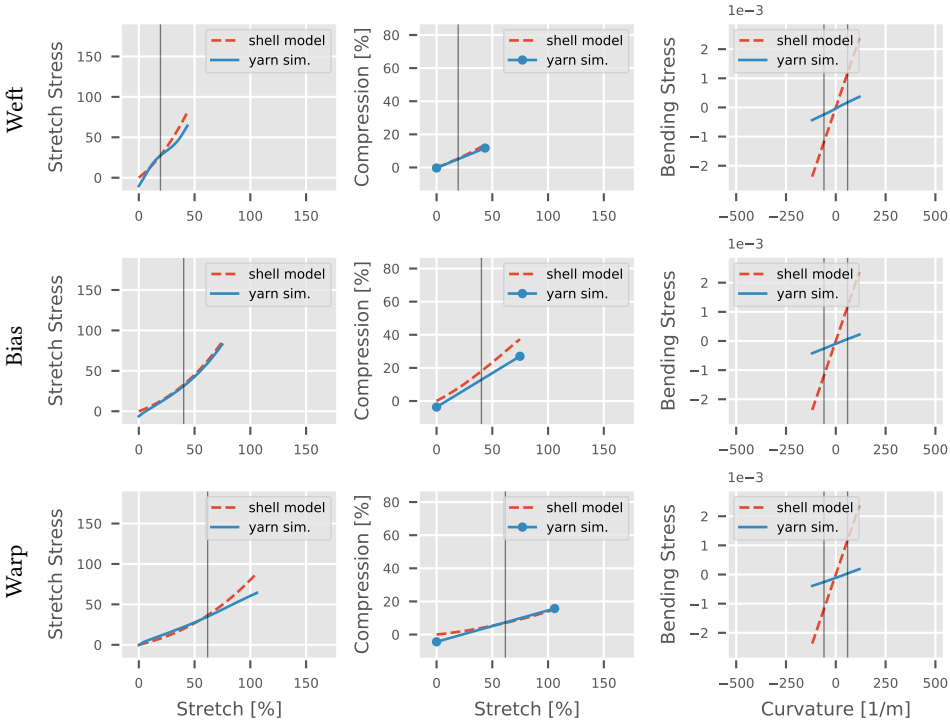
Parameter	Value
k_{xx}	1.04e+02
k_{xy}	0
k_{yy}	2.51e+01
k_{ss}	1.92e+01
k_{n1}	4.03e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	4.98e-06
$k_{\theta,bias}$	5.78e-06
$k_{\theta,warp}$	5.68e-06



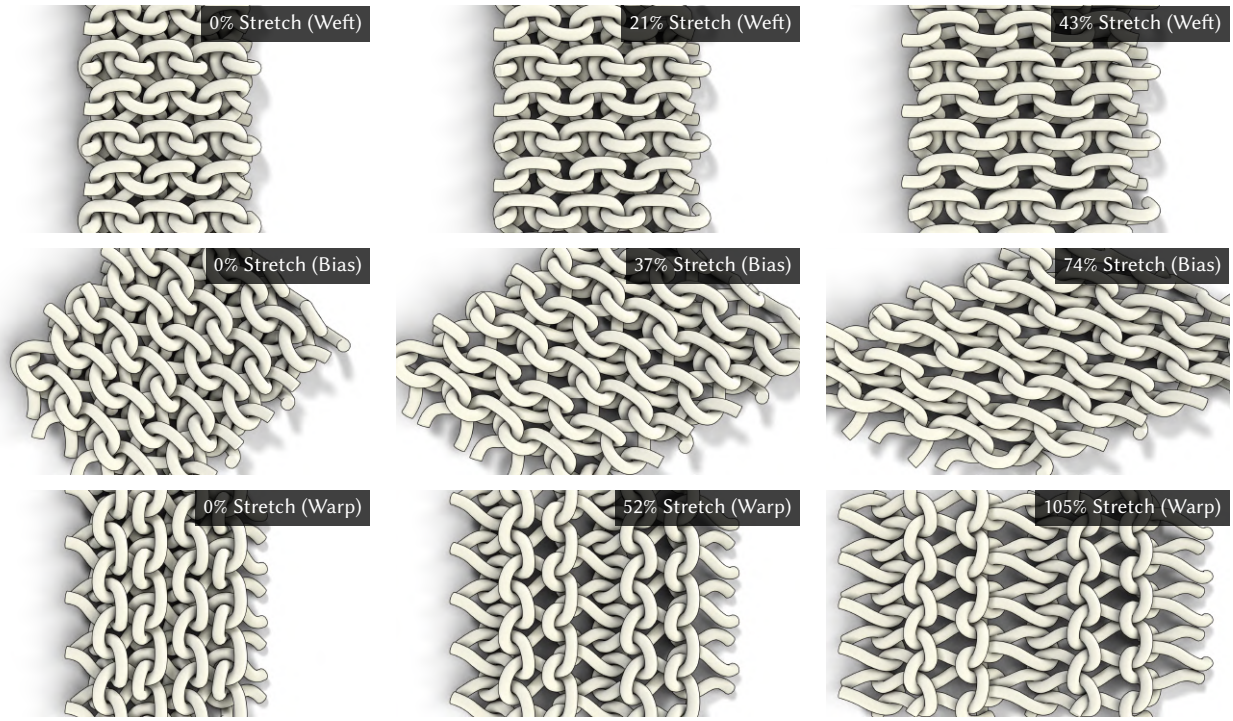
Yarn-Level Fit

Fitting error	%
Comfort Stretch	8
Full Stretch	18
Compression	16
Bending Stiffness	70

Parameter	Value
k_{s1}	1.85e-02
$\bar{\varepsilon}_s$	1.06e-01
k_b	4.46e-09
R_1	2.30e-04
k_{c1}	1.00e+02
k_{s2}	1.85e+01
R_2	6.23e-05
k_{c2}	1.00e+03
R_{visual}	1.63e-04

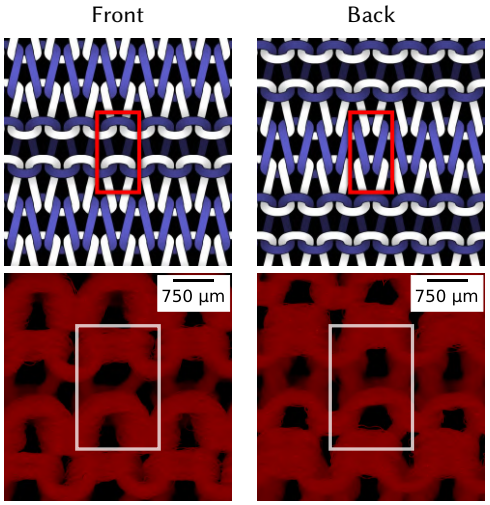


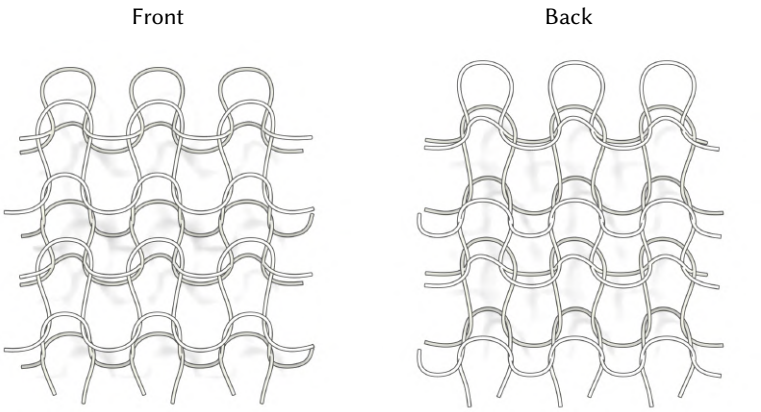
Yarn-Level Simulations



L3: LINKS

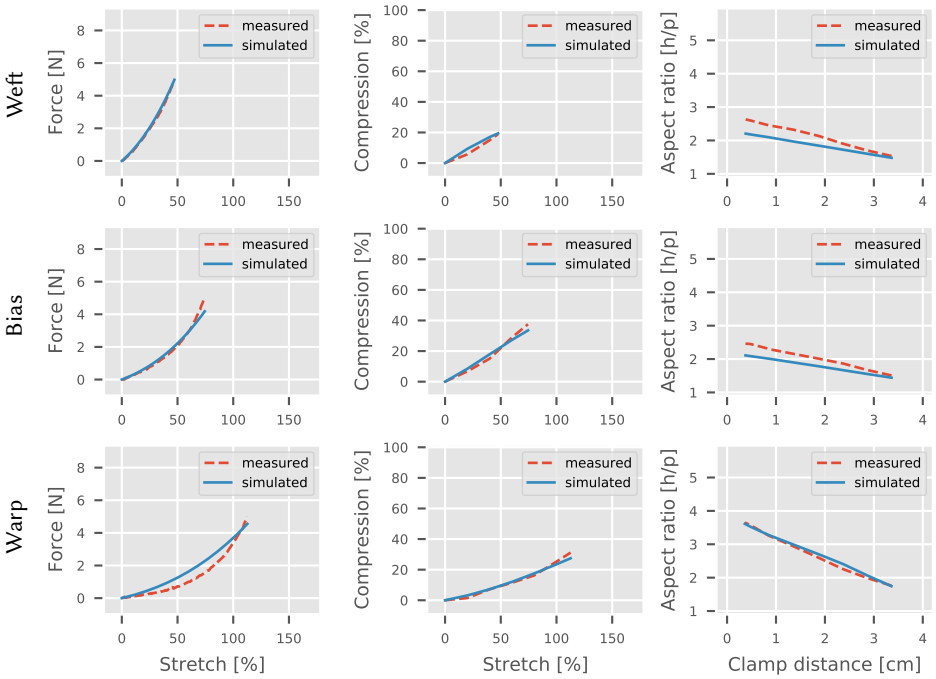
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	3	284	1.45	1.51×2.26	-





Thin-Shell Fit

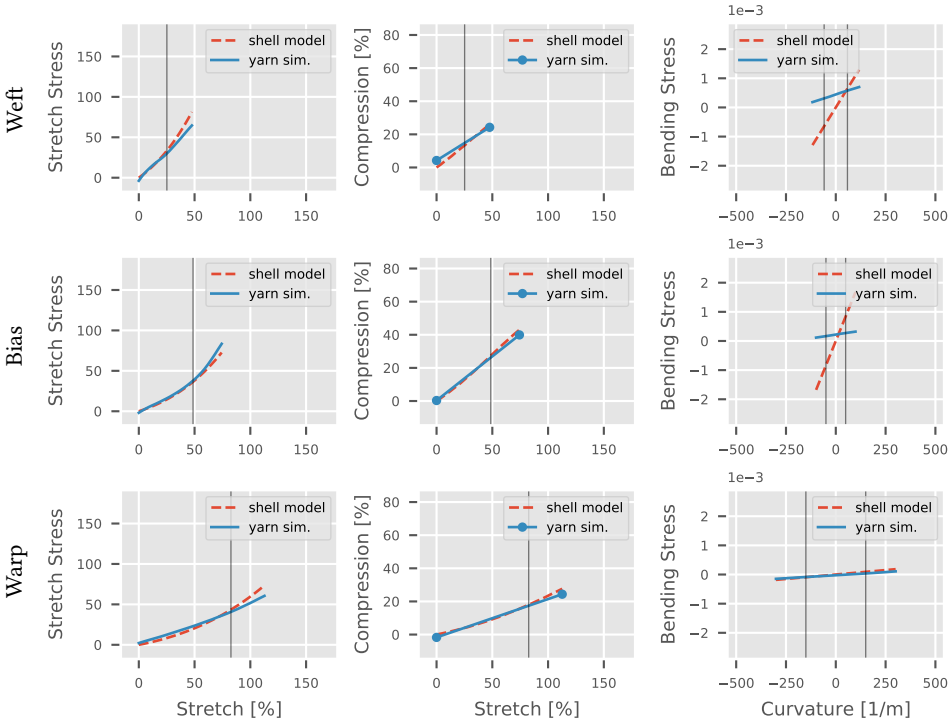
Parameter	Value
k_{xx}	9.45e+01
k_{xy}	4.60e+00
k_{yy}	1.93e+01
k_{ss}	1.53e+01
k_{n1}	4.56e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	3.05e-07
$k_{\theta,bias}$	8.48e-06
$k_{\theta,warp}$	5.52e-06



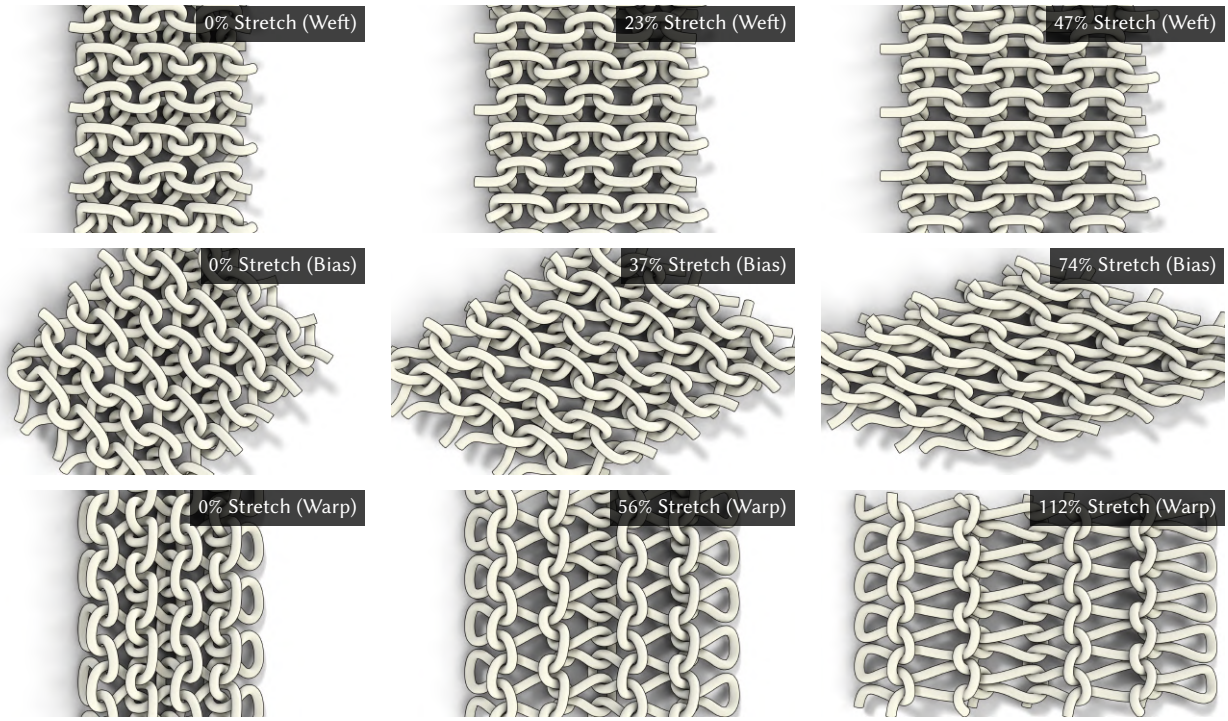
Yarn-Level Fit

Fitting error	%
Comfort Stretch	4
Full Stretch	11
Compression	6
Bending Stiffness	42

Parameter	Value
k_{s1}	2.27e-02
$\bar{\varepsilon}_s$	1.17e-01
k_b	2.03e-09
R_1	2.21e-04
k_{c1}	1.00e+02
k_{s2}	1.85e+01
R_2	5.43e-05
k_{c2}	1.00e+03
R_{visual}	1.38e-04

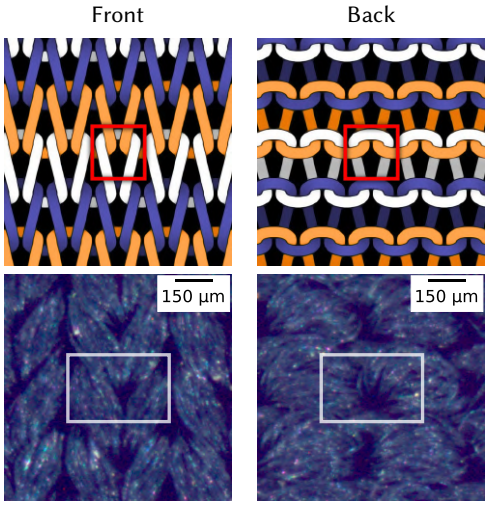


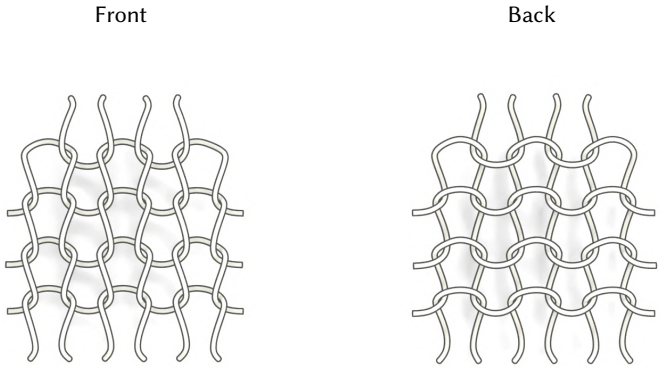
Yarn-Level Simulations



SJ1: SINGLE JERSEY

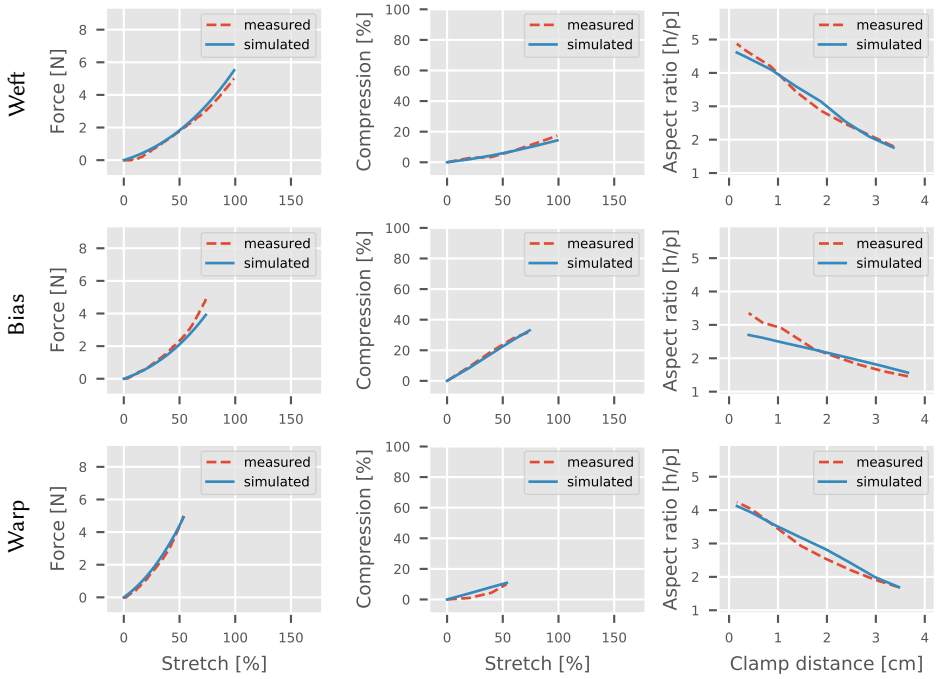
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	90	1	159	0.43	0.40 × 0.27	Anti-microbial
20D Spandex	10	1				





Thin-Shell Fit

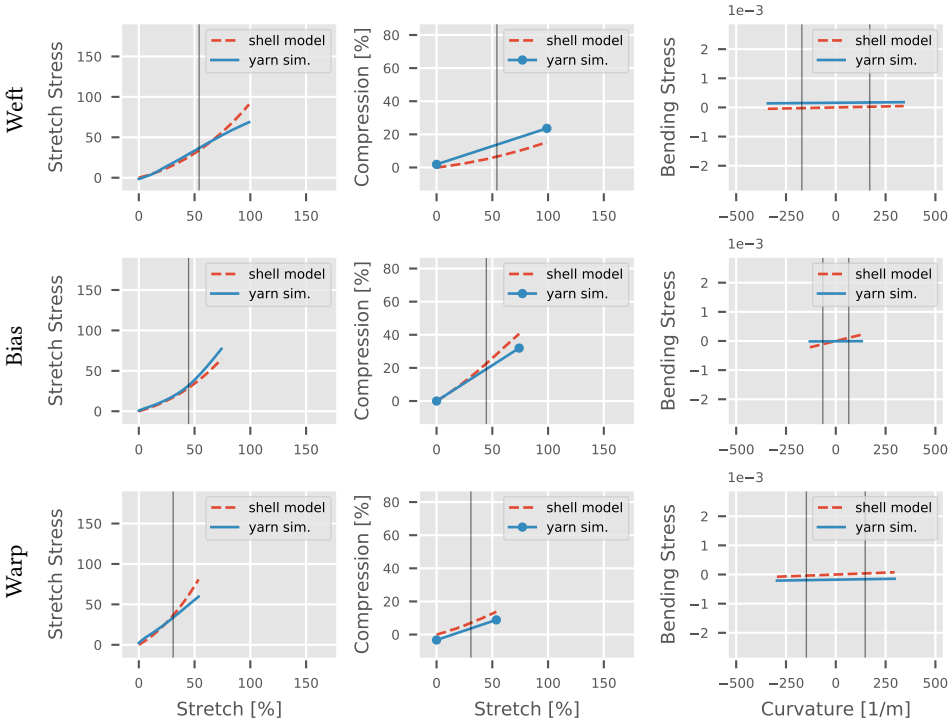
Parameter	Value
k_{xx}	2.96e+01
k_{xy}	0
k_{yy}	7.56e+01
k_{ss}	1.41e+01
k_{n1}	3.29e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.30e-07
$k_{\theta,bias}$	8.37e-07
$k_{\theta,warp}$	6.92e-08



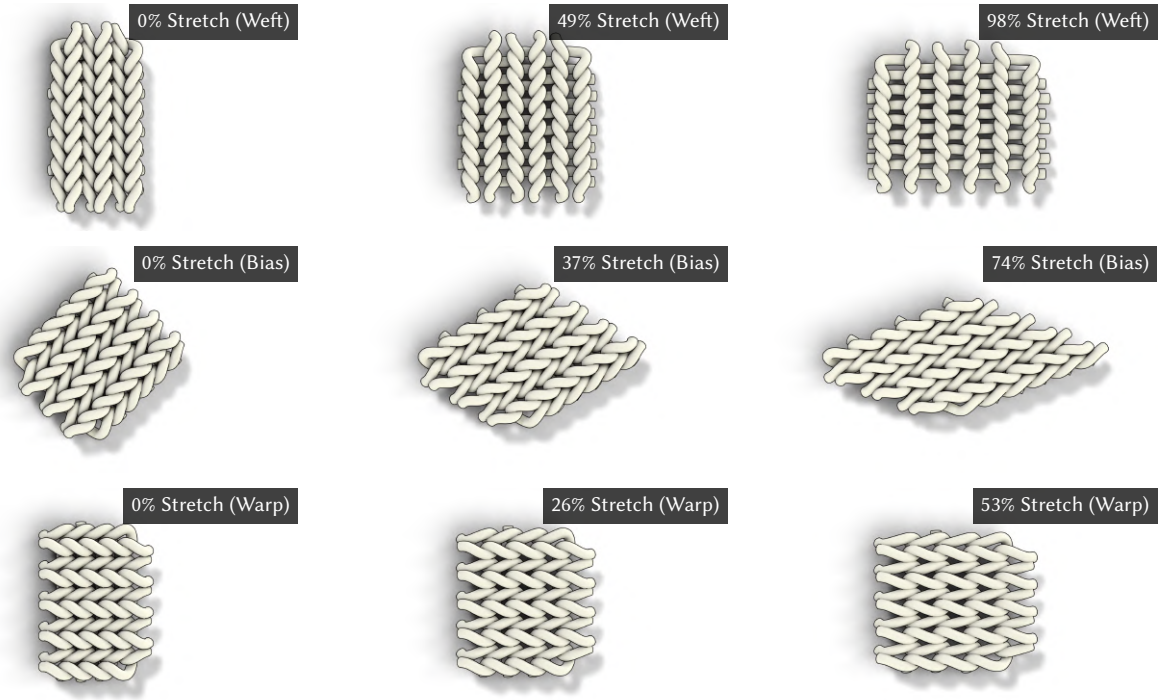
Yarn-Level Fit

Fitting error	%
Comfort Stretch	5
Full Stretch	19
Compression	21
Bending Stiffness	33

Parameter	Value
k_{s1}	2.65e-01
$\bar{\varepsilon}_s$	1.23e-01
k_b	7.99e-11
R_1	6.74e-05
k_{c1}	1.00e+02
k_{s2}	1.03e+01
R_2	2.34e-05
k_{c2}	1.00e+03
R_{visual}	7.06e-05

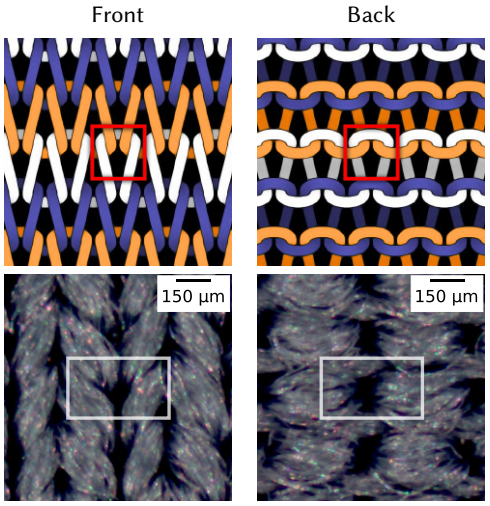


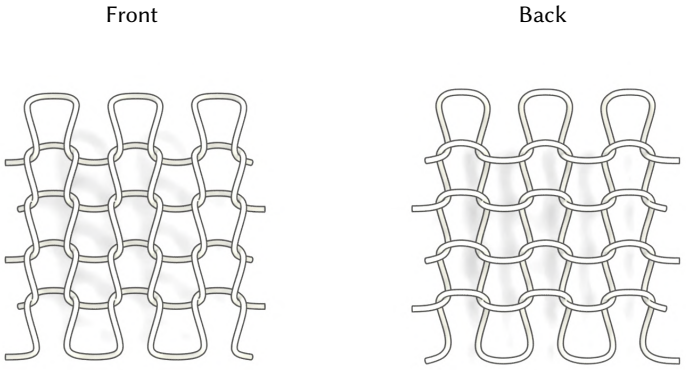
Yarn-Level Simulations



SJ2: SINGLE JERSEY

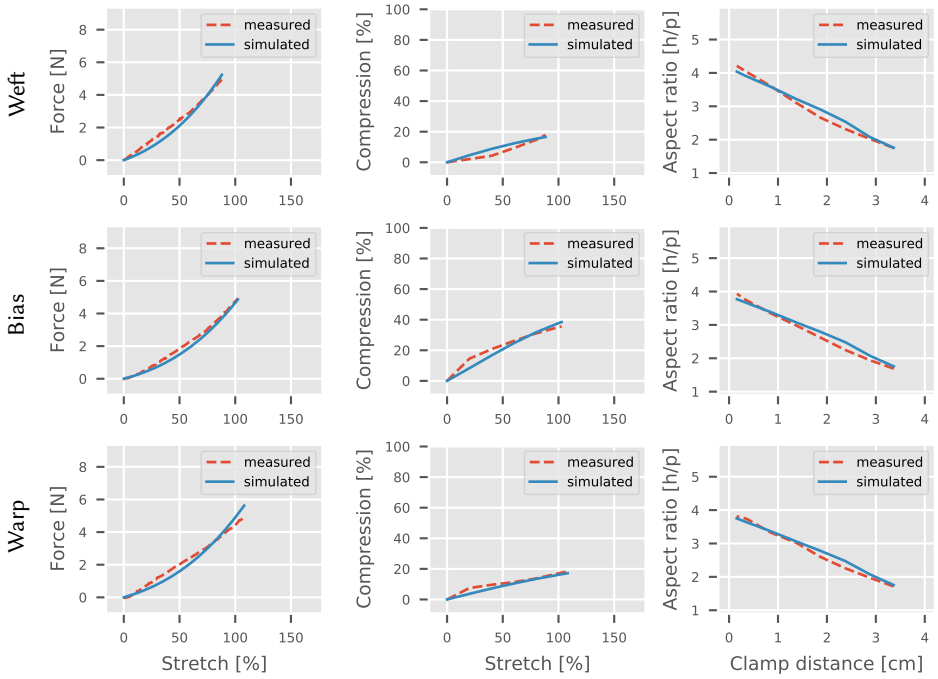
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
20D Spandex	16	2	176	0.48	0.44 × 0.26	Anti-microbial
75D/72F Polyester	84	1				





Thin-Shell Fit

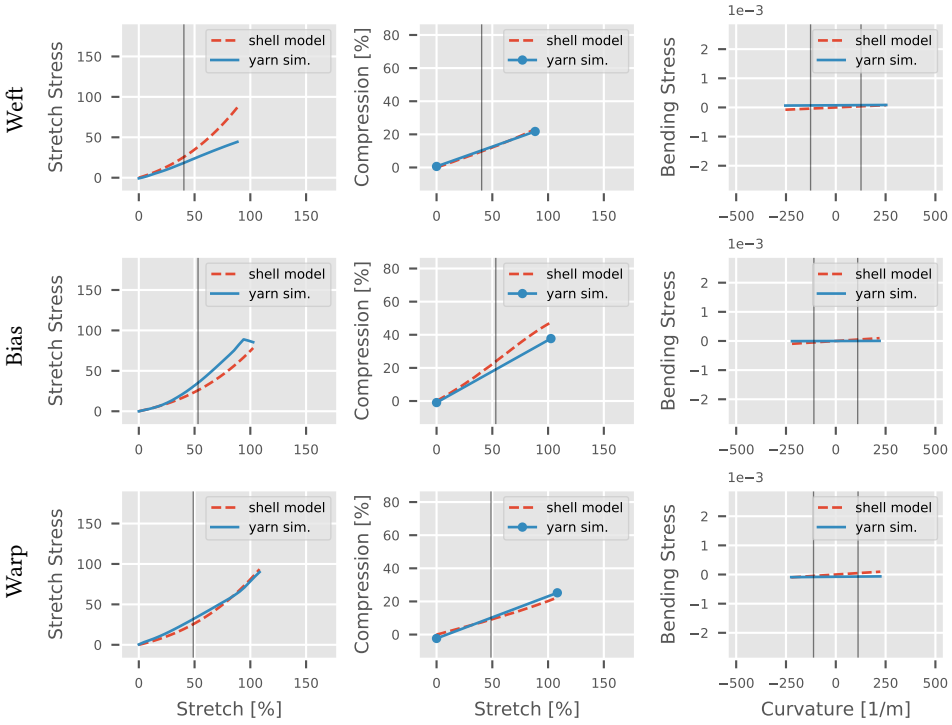
Parameter	Value
k_{xx}	3.55e+01
k_{xy}	0
k_{yy}	2.63e+01
k_{ss}	1.05e+01
k_{n1}	4.50e-01
k_{n2}	3.49e+00
$k_{\theta,weft}$	2.17e-07
$k_{\theta,bias}$	2.19e-07
$k_{\theta,warp}$	1.55e-07



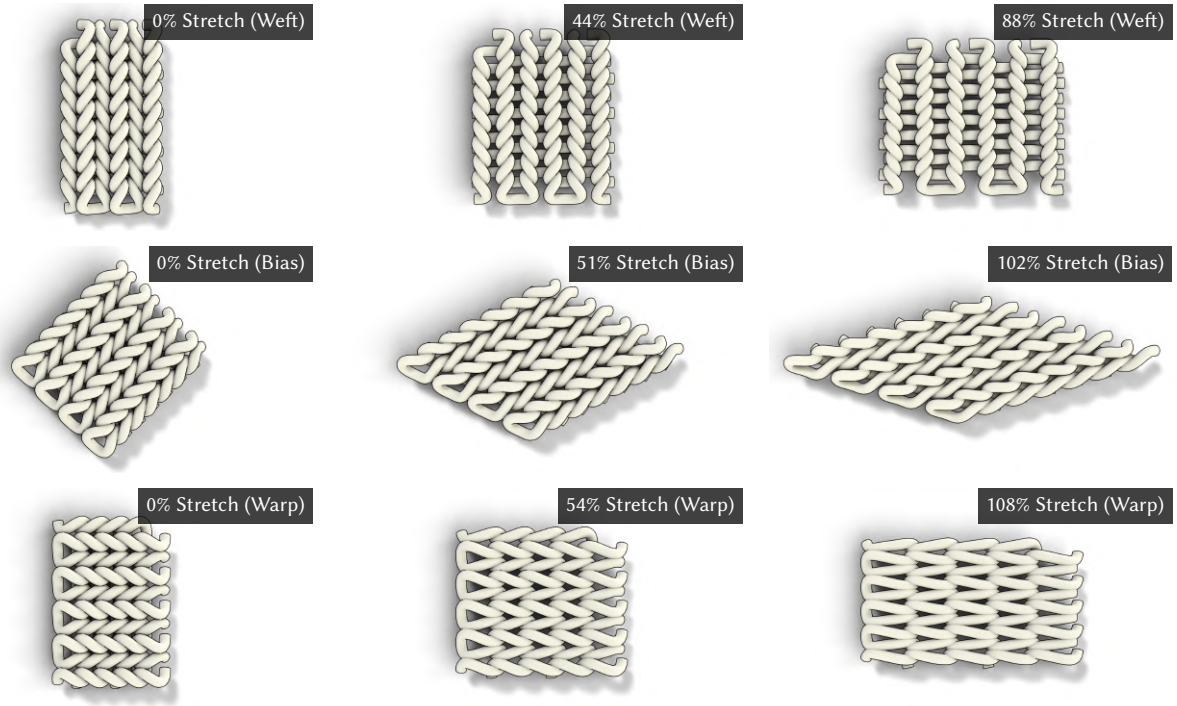
Yarn-Level Fit

Fitting error	%
Comfort Stretch	15
Full Stretch	43
Compression	12
Bending Stiffness	72

Parameter	Value
k_{s1}	1.60e-01
$\bar{\varepsilon}_s$	9.10e-02
k_b	5.44e-11
R_1	6.68e-05
k_{c1}	9.34e+01
k_{s2}	1.03e+01
R_2	2.45e-05
k_{c2}	1.00e+03
R_{visual}	7.33e-05

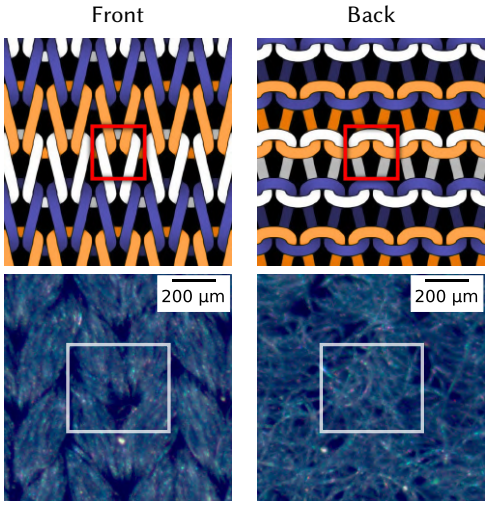


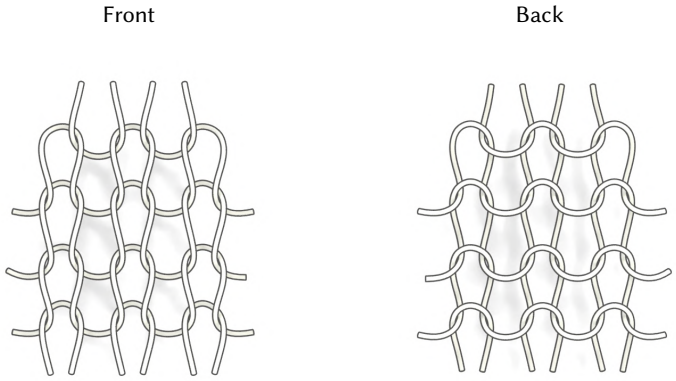
Yarn-Level Simulations



SJ3: SINGLE JERSEY

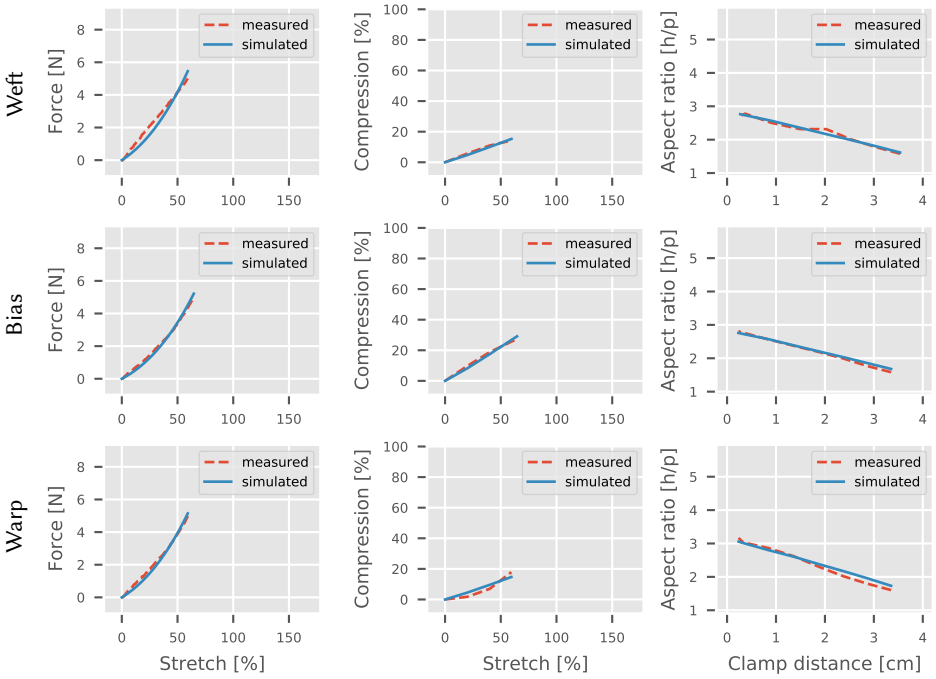
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
55D Spandex	13	1	238	0.63	0.47 × 0.40	Water Repellent
50D/72F Polyester	87	3				





Thin-Shell Fit

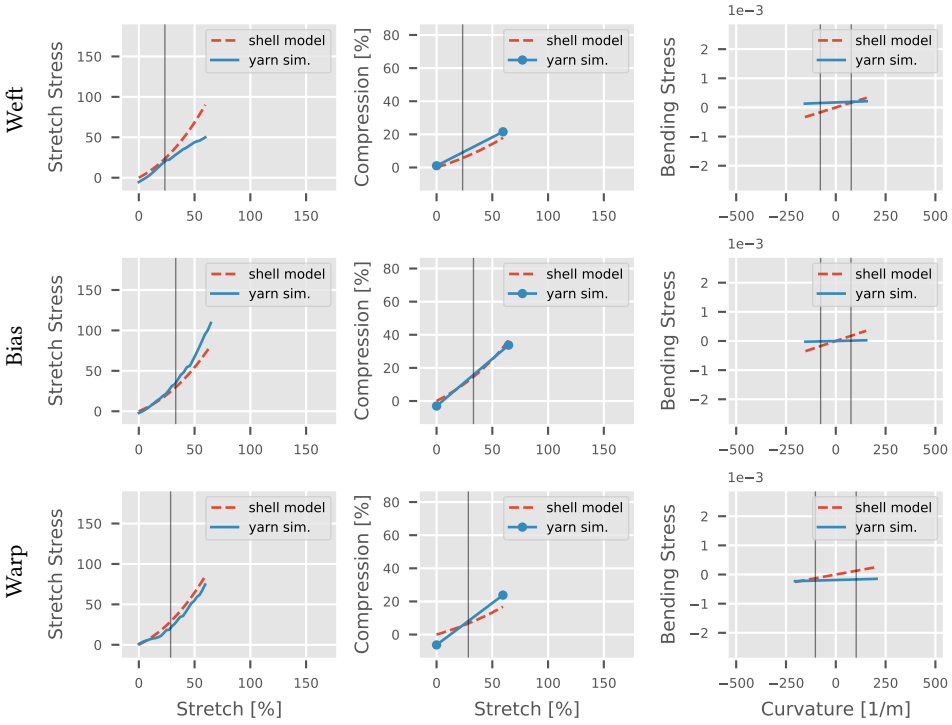
Parameter	Value
k_{xx}	7.62e+01
k_{xy}	1.51e+01
k_{yy}	7.19e+01
k_{ss}	2.15e+01
k_{n1}	2.96e-02
k_{n2}	1.56e-02
$k_{\theta,weft}$	6.25e-07
$k_{\theta,bias}$	1.15e-06
$k_{\theta,warp}$	1.07e-06



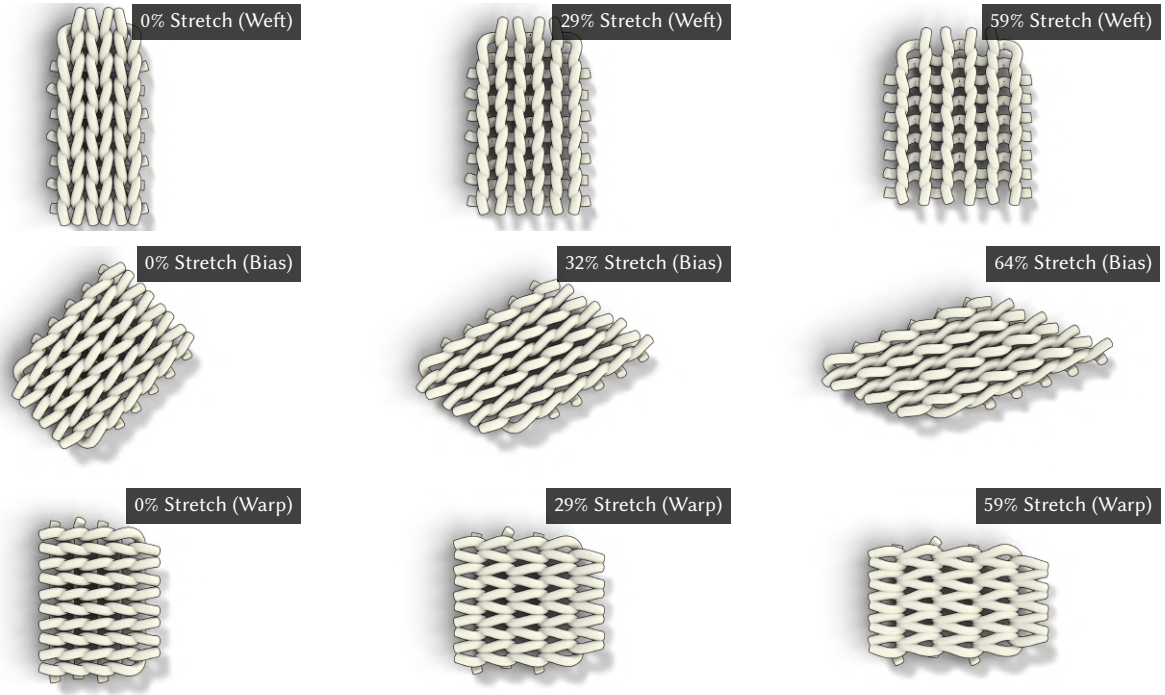
Yarn-Level Fit

Fitting error	%
Comfort Stretch	13
Full Stretch	39
Compression	21
Bending Stiffness	64

Parameter	Value
k_{s1}	4.40e-01
$\bar{\varepsilon}_s$	1.11e-01
k_b	1.31e-09
R_1	1.40e-04
k_{c1}	4.06e+00
k_{s2}	8.33e+00
R_2	2.99e-05
k_{c2}	1.00e+03
R_{visual}	8.60e-05

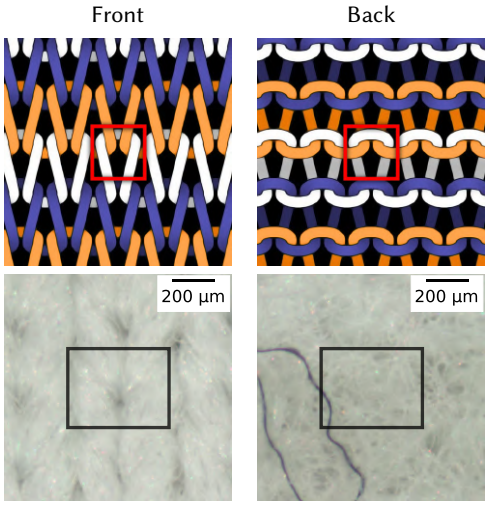


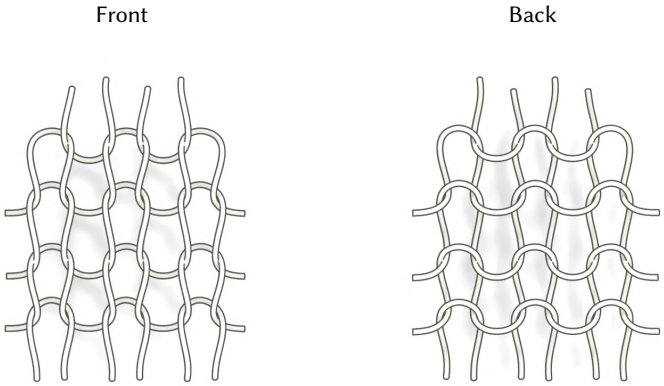
Yarn-Level Simulations



SJ4: SINGLE JERSEY

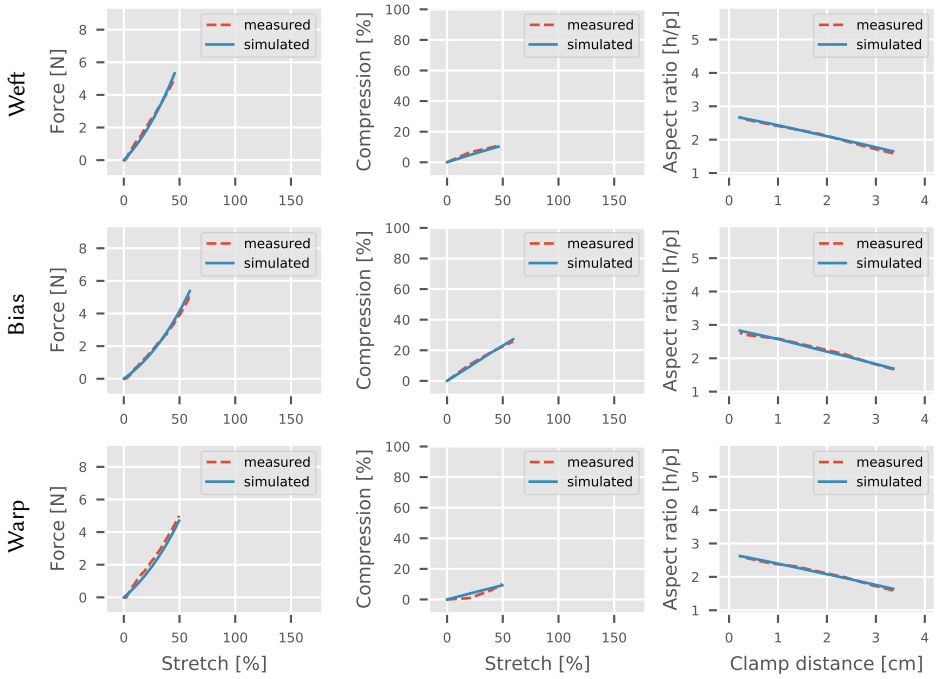
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
55D Spandex	13	1	240	0.63	0.47 × 0.37	Water Repellent,
50D/72F Polyester	87	3				Functional Print - Back





Thin-Shell Fit

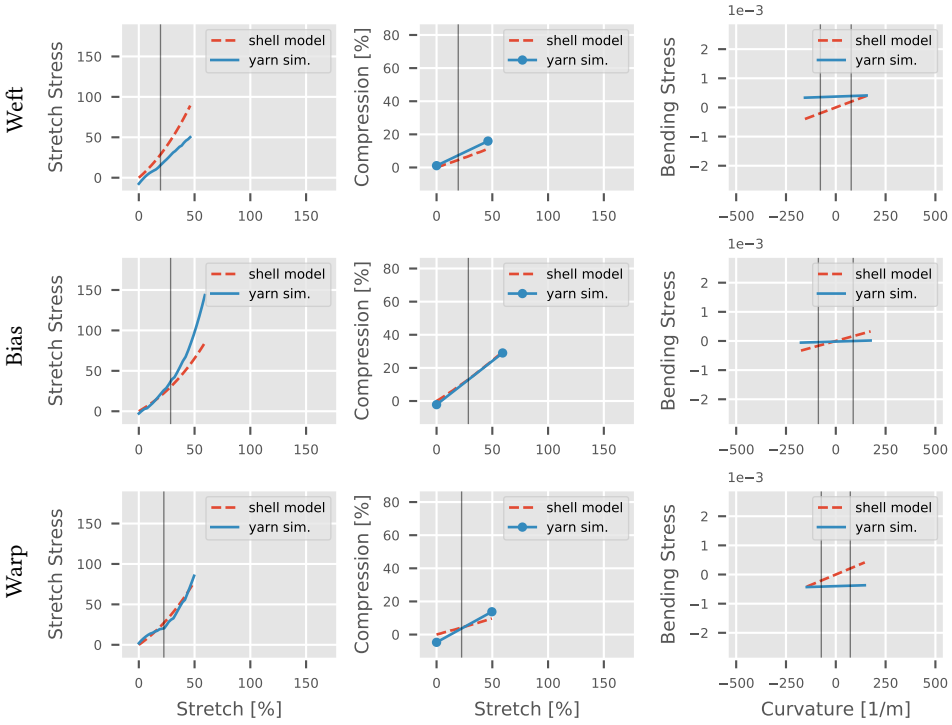
Parameter	Value
k_{xx}	1.02e+02
k_{xy}	0
k_{yy}	7.82e+01
k_{ss}	2.83e+01
k_{n1}	2.07e+00
k_{n2}	9.54e+00
$k_{\theta,weft}$	1.43e-06
$k_{\theta,bias}$	9.44e-07
$k_{\theta,warp}$	1.28e-06



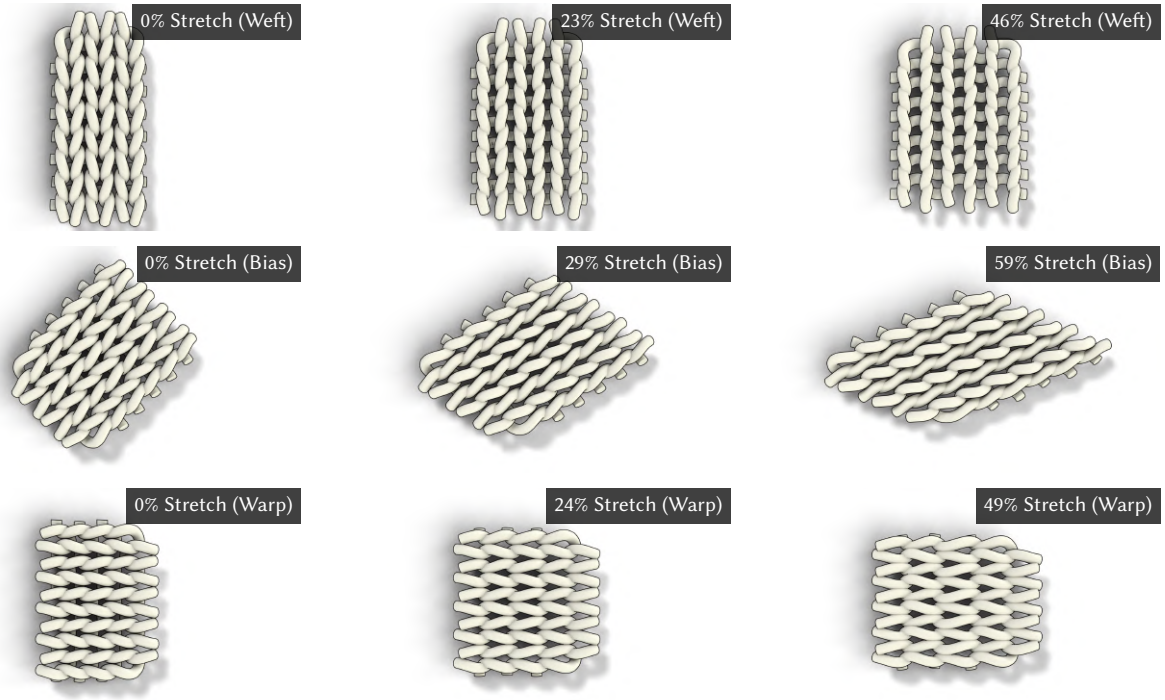
Yarn-Level Fit

Fitting error	%
Comfort Stretch	16
Full Stretch	49
Compression	16
Bending Stiffness	69

Parameter	Value
k_{s1}	1.20e+00
$\bar{\varepsilon}_s$	5.48e-02
k_b	1.13e-09
R_1	1.33e-04
k_{c1}	8.94e+00
k_{s2}	8.33e+00
R_2	3.04e-05
k_{c2}	1.00e+03
R_{visual}	8.64e-05

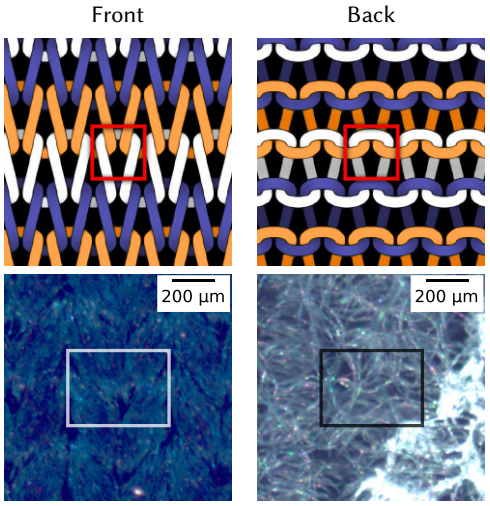


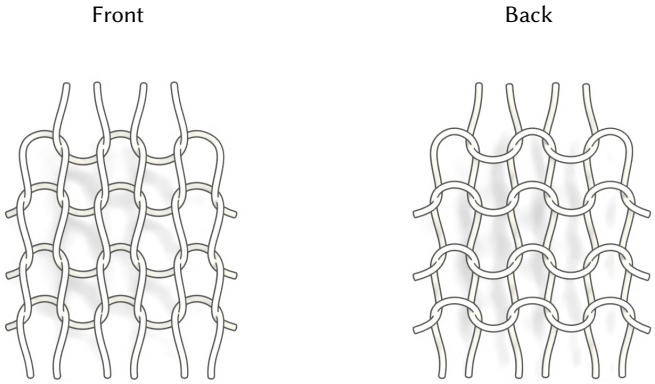
Yarn-Level Simulations



SJ5: SINGLE JERSEY

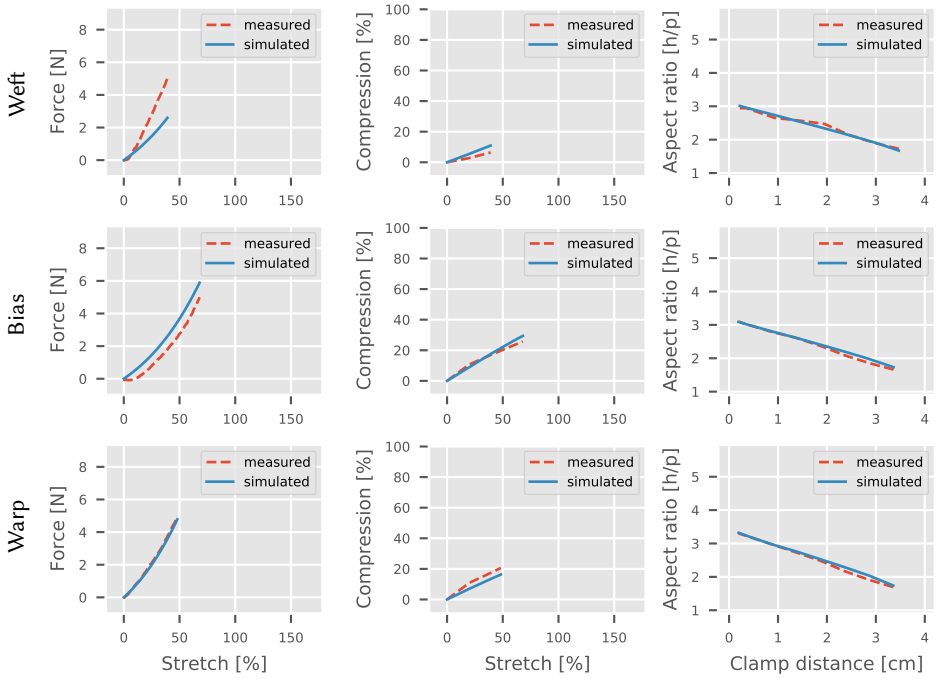
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
55D Spandex	13	1	250	0.59	0.47 × 0.35	Water Repellent,
50D/72F Polyester	87	3				Functional Print - Back





Thin-Shell Fit

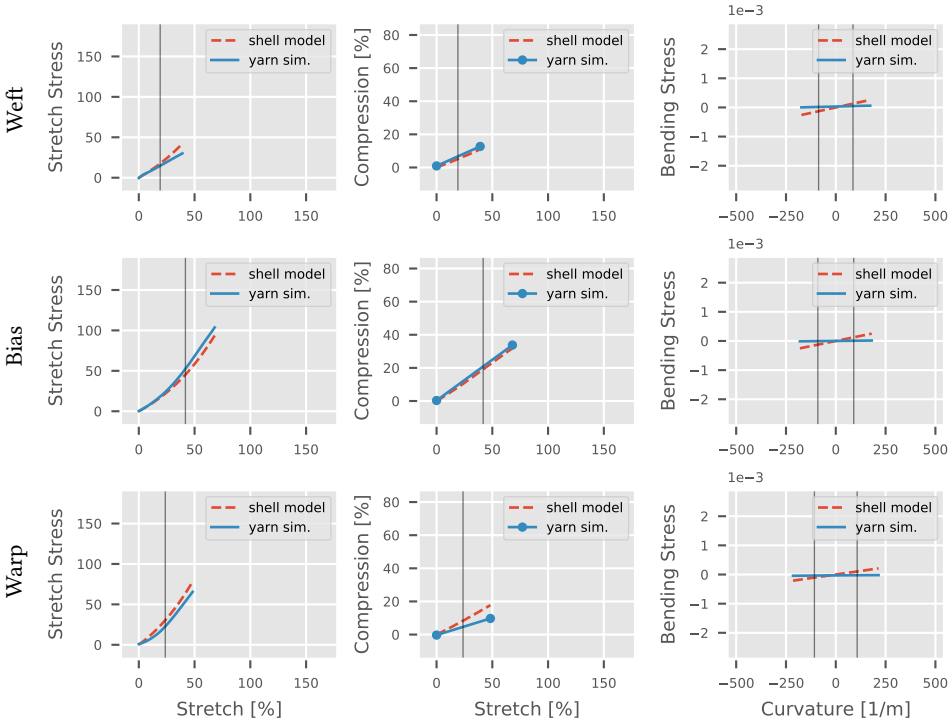
Parameter	Value
k_{xx}	5.74e+01
k_{xy}	0
k_{yy}	8.32e+01
k_{ss}	2.68e+01
k_{n1}	4.07e+00
k_{n2}	1.04e+01
$k_{\theta,weft}$	4.91e-07
$k_{\theta,bias}$	7.00e-07
$k_{\theta,warp}$	7.49e-07



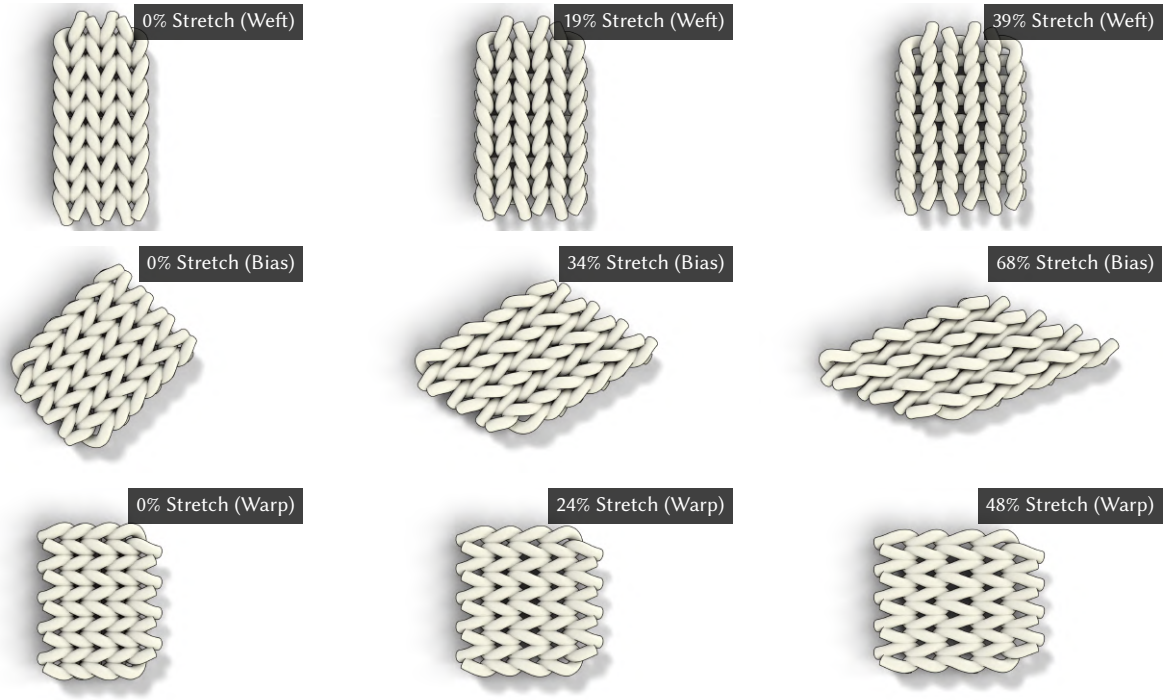
Yarn-Level Fit

Fitting error	%
Comfort Stretch	7
Full Stretch	14
Compression	13
Bending Stiffness	73

Parameter	Value
k_{s1}	2.58e-01
$\bar{\varepsilon}_s$	1.07e-01
k_b	8.51e-10
R_1	6.29e-05
k_{c1}	9.05e+01
k_{s2}	8.33e+00
R_2	2.86e-05
k_{c2}	1.00e+03
R_{visual}	9.75e-05

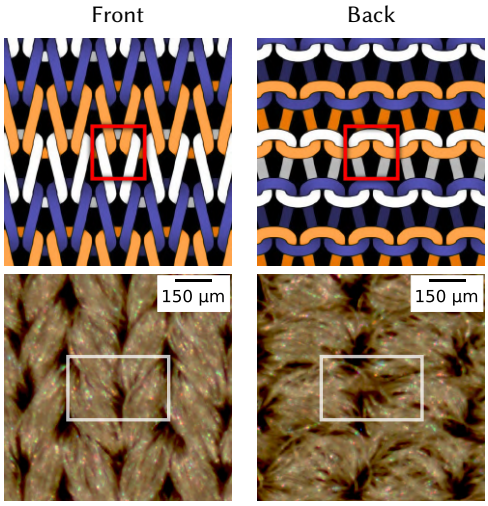


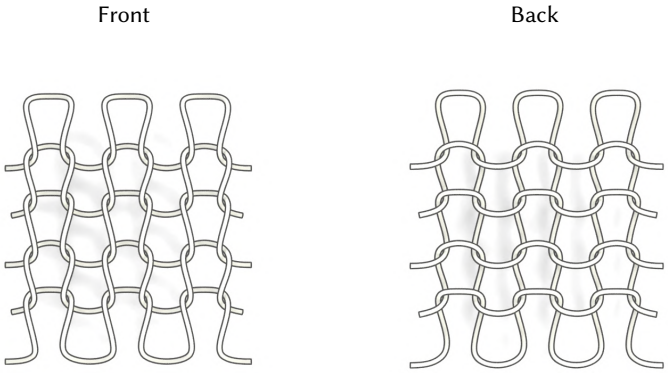
Yarn-Level Simulations



SJ6: SINGLE JERSEY

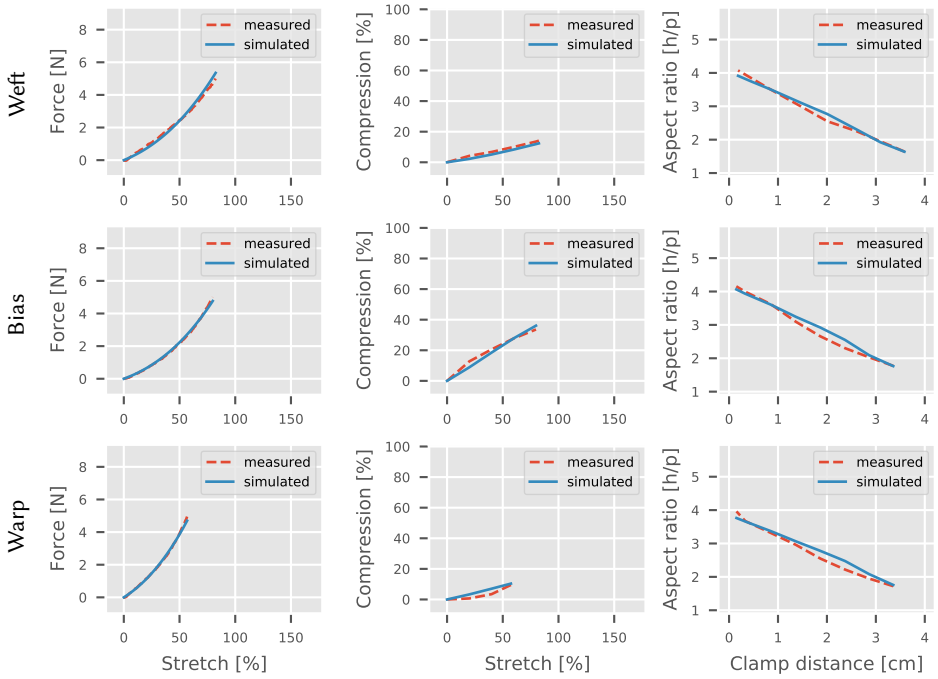
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	90	1	168	0.44	0.41 × 0.26	Anti-microbial
20D Spandex	10	1				





Thin-Shell Fit

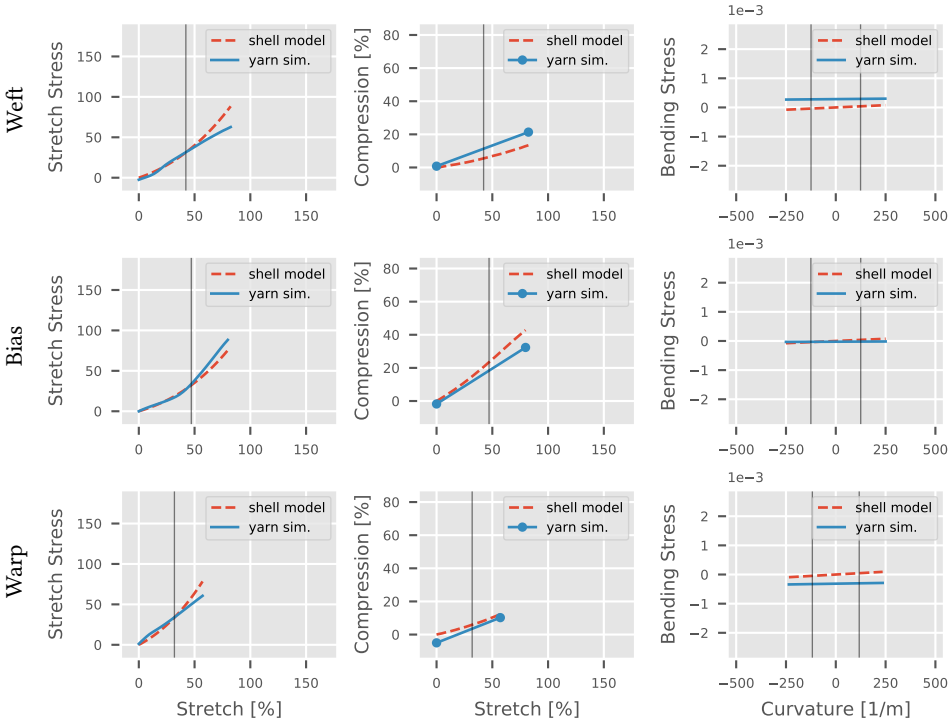
Parameter	Value
k_{xx}	4.00e+01
k_{xy}	0
k_{yy}	6.59e+01
k_{ss}	1.46e+01
k_{n1}	3.39e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.95e-07
$k_{\theta,bias}$	1.53e-07
$k_{\theta,warp}$	1.57e-07



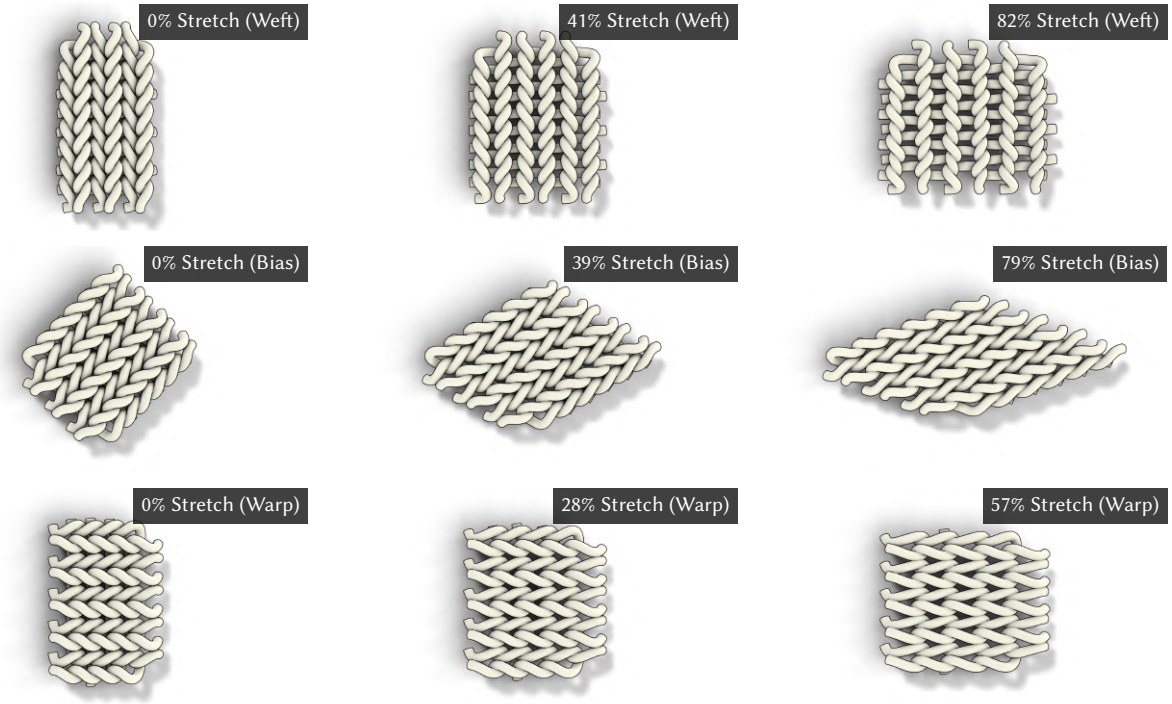
Yarn-Level Fit

Fitting error	%
Comfort Stretch	6
Full Stretch	22
Compression	20
Bending Stiffness	51

Parameter	Value
k_{s1}	3.14e-01
$\bar{\varepsilon}_s$	1.48e-01
k_b	4.44e-11
R_1	6.99e-05
k_{c1}	9.57e+01
k_{s2}	1.03e+01
R_2	2.28e-05
k_{c2}	1.00e+03
R_{visual}	6.54e-05

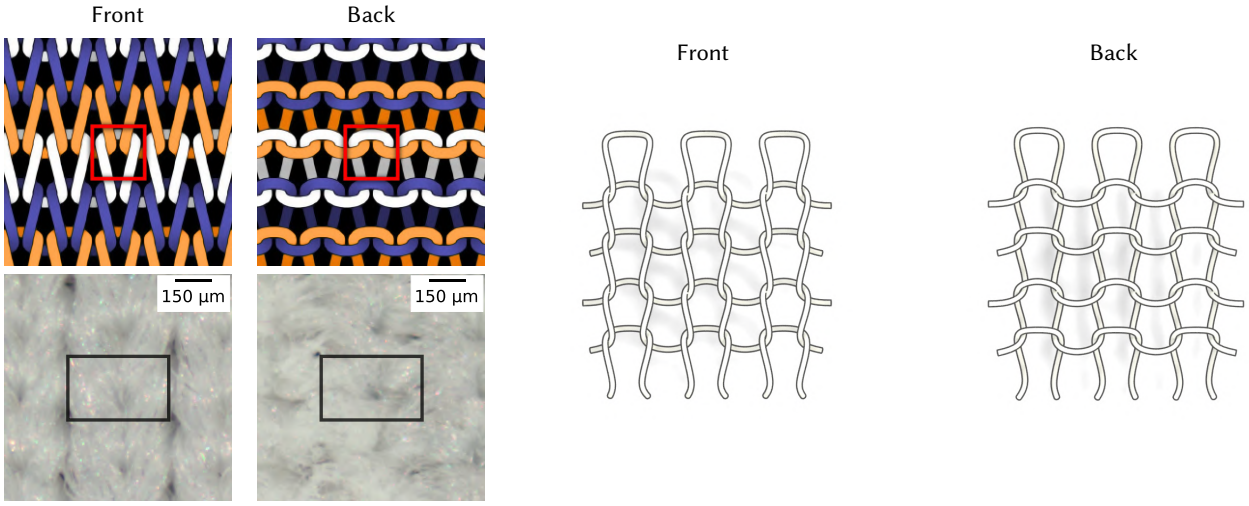


Yarn-Level Simulations



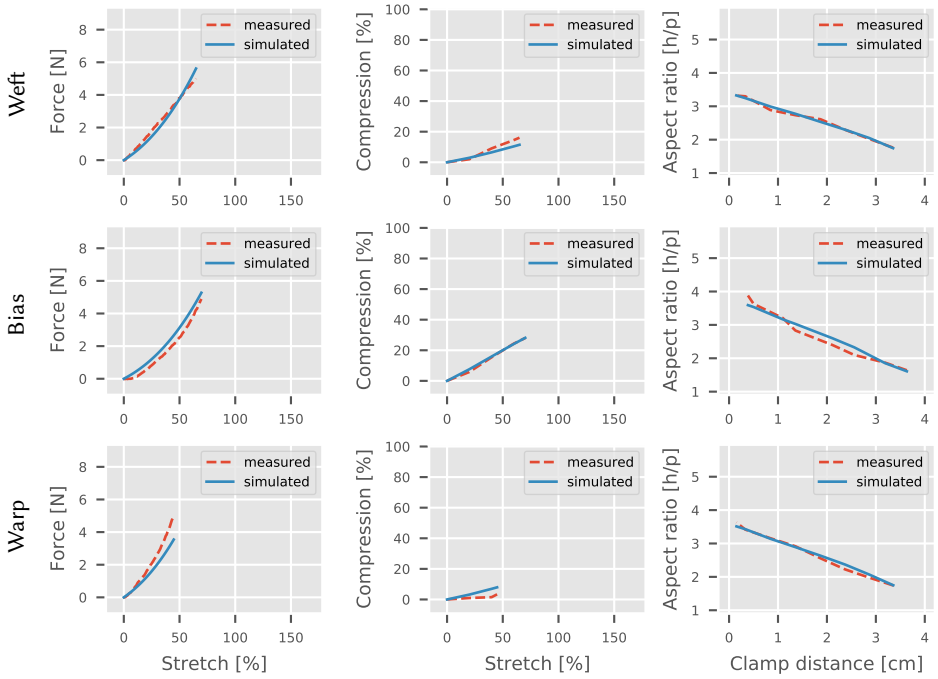
SJ7: SINGLE JERSEY

Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	90	1	166	0.44	0.41 × 0.26	Anti-microbial, Functional Print - Back
20D Spandex	10	1				



Thin-Shell Fit

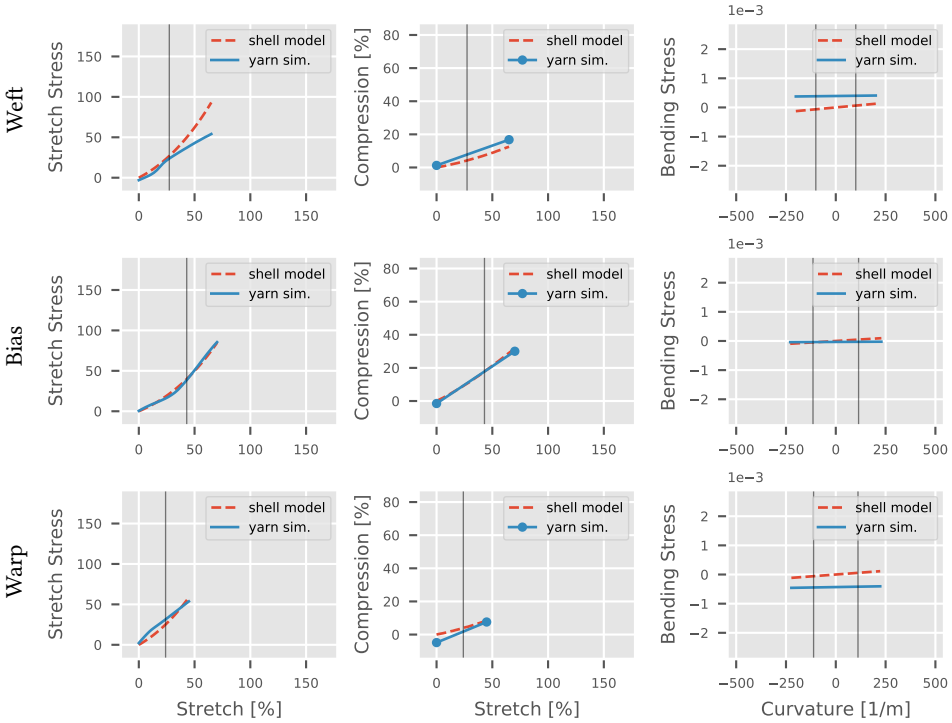
Parameter	Value
k_{xx}	6.28e+01
k_{xy}	0
k_{yy}	7.00e+01
k_{ss}	2.19e+01
k_{n1}	4.93e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	2.57e-07
$k_{\theta,bias}$	2.09e-07
$k_{\theta,warp}$	3.17e-07



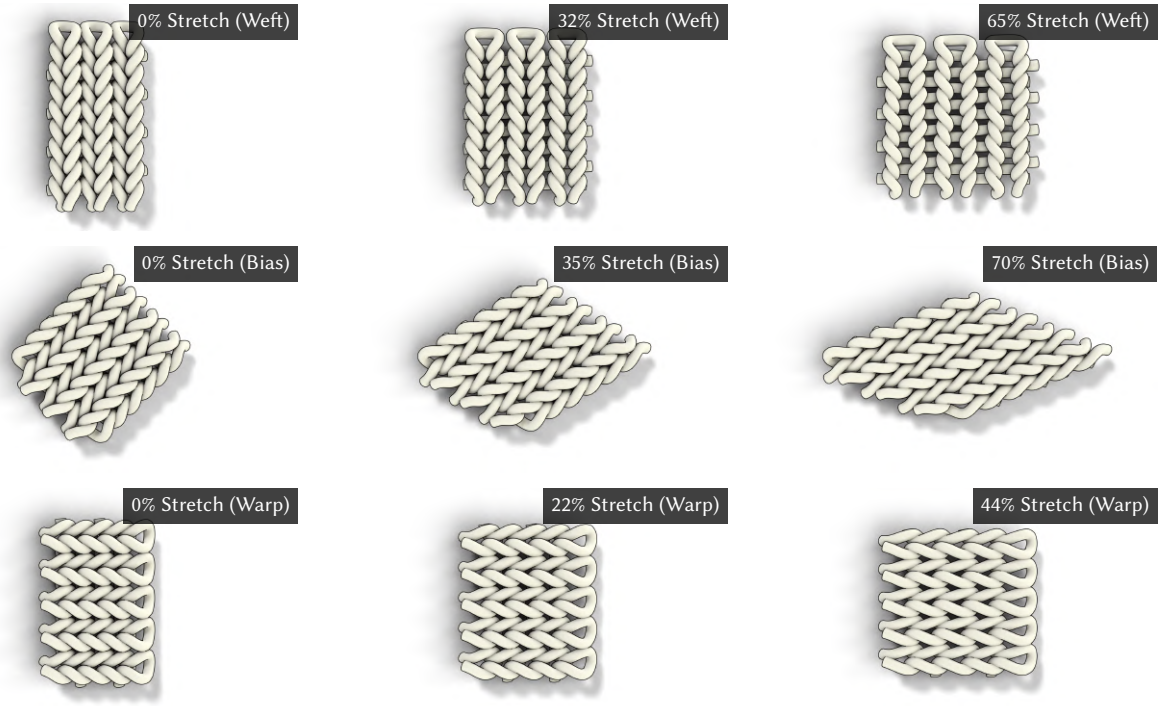
Yarn-Level Fit

Fitting error	%
Comfort Stretch	10
Full Stretch	19
Compression	12
Bending Stiffness	57

Parameter	Value
k_{s1}	3.72e-01
$\bar{\varepsilon}_s$	1.44e-01
k_b	5.03e-11
R_1	7.20e-05
k_{c1}	8.77e+01
k_{s2}	1.03e+01
R_2	2.46e-05
k_{c2}	1.00e+03
R_{visual}	7.26e-05

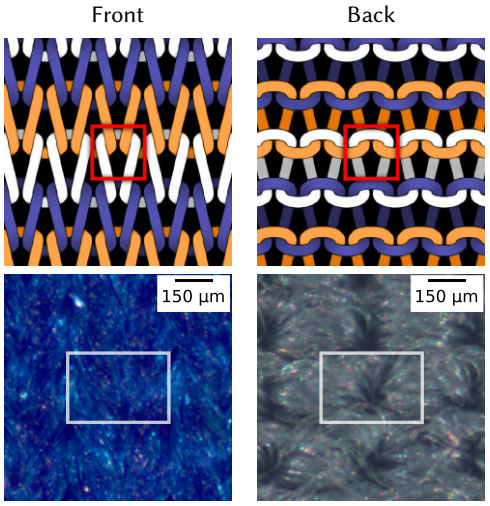


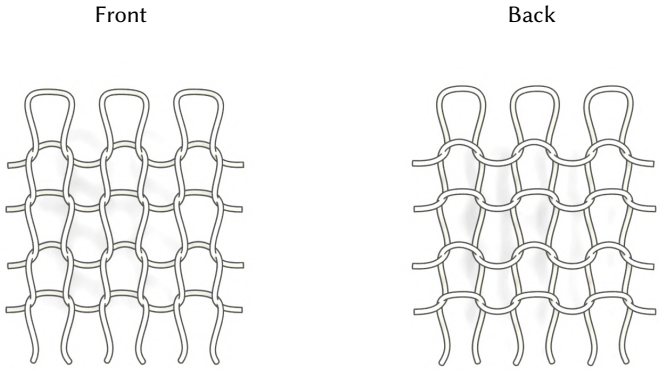
Yarn-Level Simulations



SJ8: SINGLE JERSEY

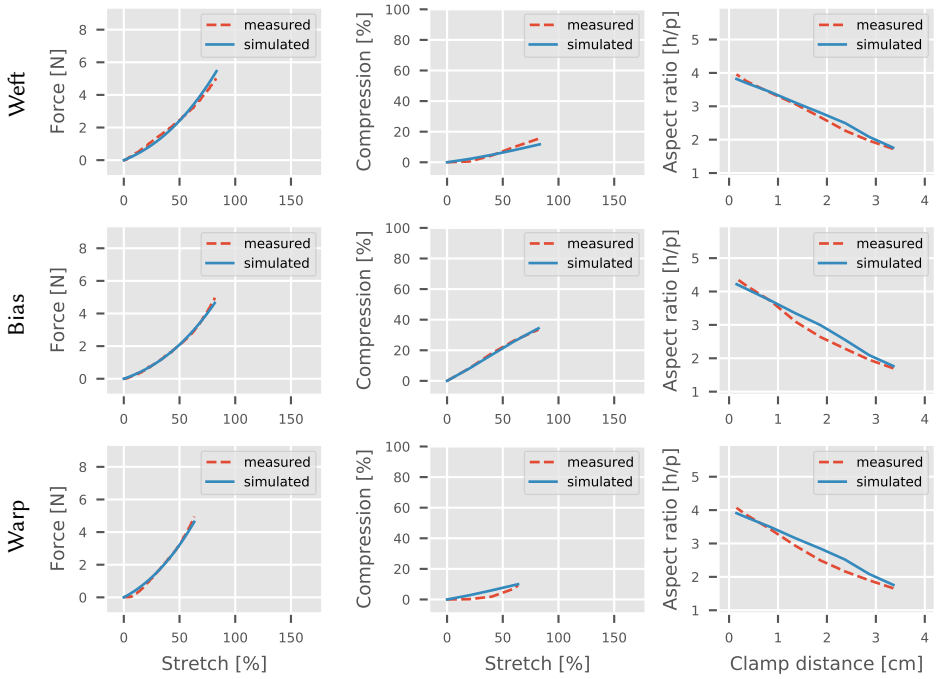
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
20D Spandex	10	1	140	0.39	0.41 × 0.28	Anti-microbial, Print
75D/72F Polyester	90	1				





Thin-Shell Fit

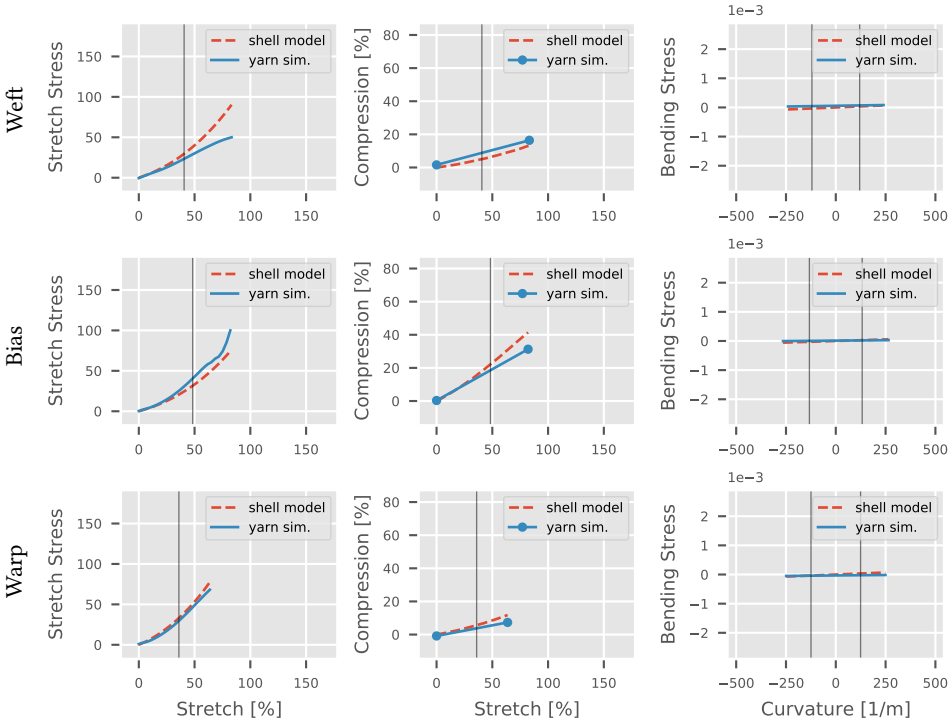
Parameter	Value
k_{xx}	4.05e+01
k_{xy}	0
k_{yy}	5.48e+01
k_{ss}	1.41e+01
k_{n1}	2.71e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.40e-07
$k_{\theta,bias}$	1.08e-07
$k_{\theta,warp}$	1.43e-07



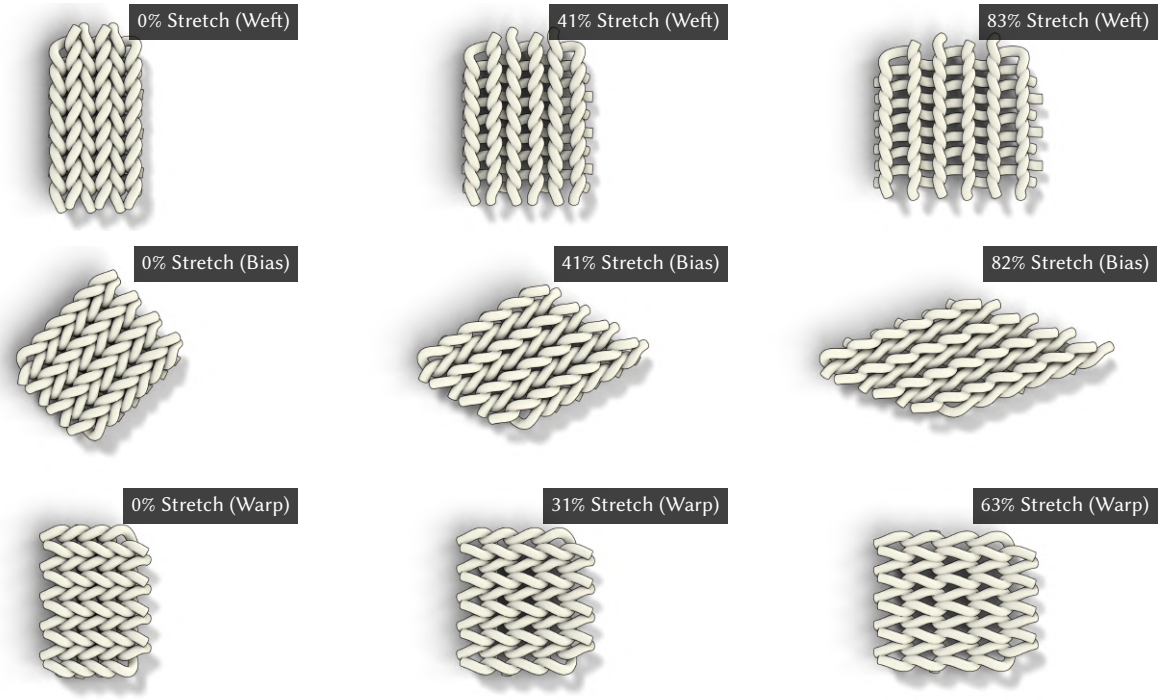
Yarn-Level Fit

Fitting error	%
Comfort Stretch	9
Full Stretch	28
Compression	15
Bending Stiffness	38

Parameter	Value
k_{s1}	1.05e-02
$\bar{\varepsilon}_s$	6.15e-02
k_b	4.00e-10
R_1	6.56e-05
k_{c1}	4.99e+01
k_{s2}	1.03e+01
R_2	2.40e-05
k_{c2}	1.00e+03
R_{visual}	7.04e-05

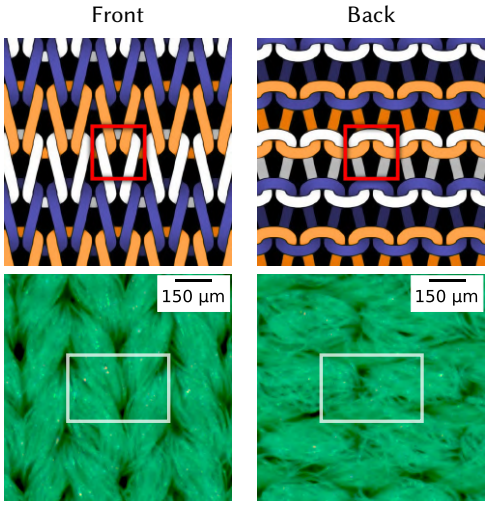


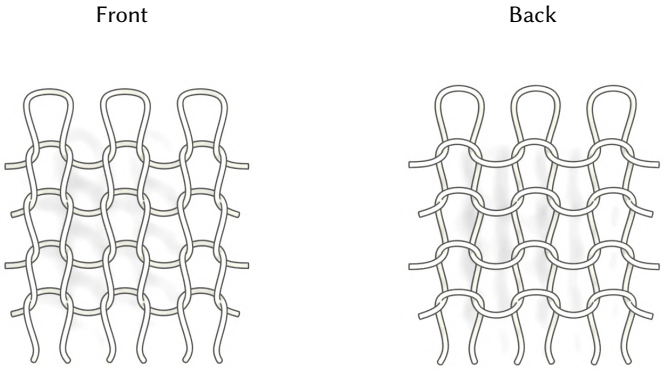
Yarn-Level Simulations



SJ9: SINGLE JERSEY

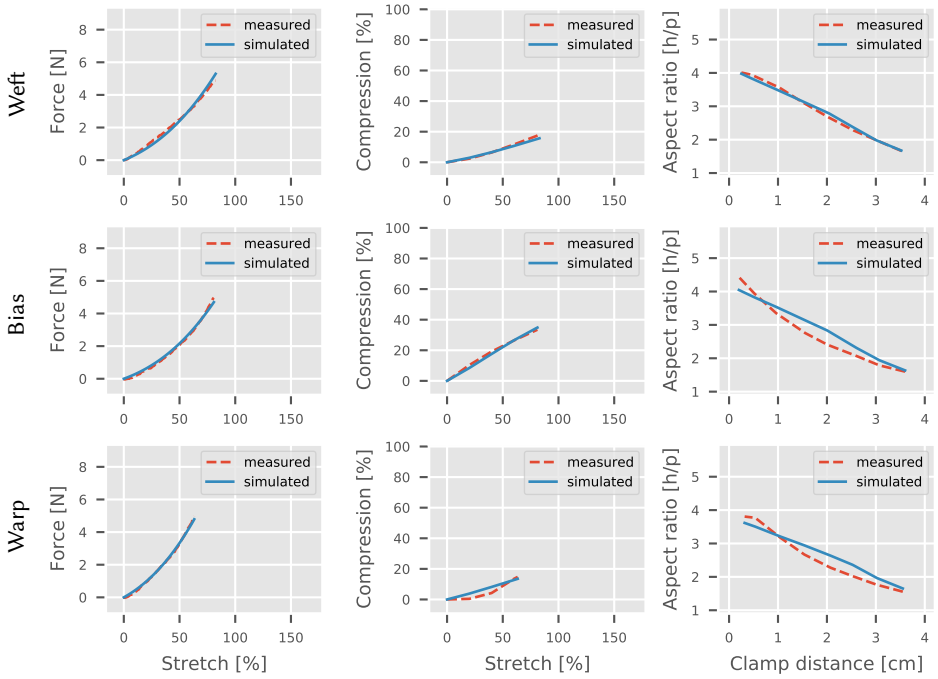
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
20D Spandex	10	1	158	0.45	0.41 × 0.27	Anti-microbial
75D/72F Polyester	90	1				





Thin-Shell Fit

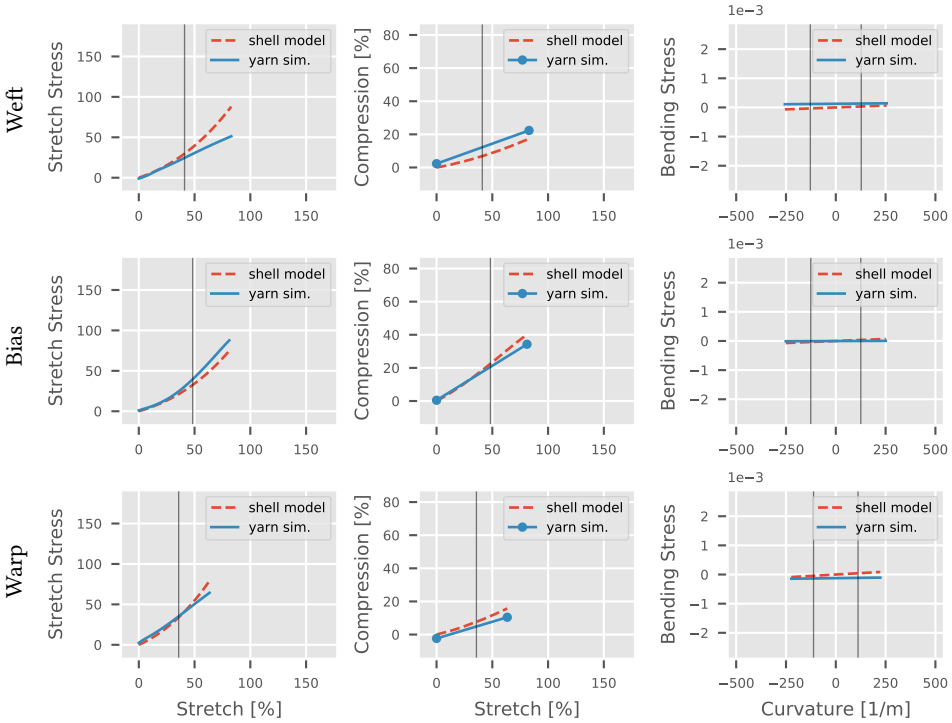
Parameter	Value
k_{xx}	3.94e+01
k_{xy}	0
k_{yy}	5.61e+01
k_{ss}	1.47e+01
k_{n1}	3.92e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.94e-07
$k_{\theta,bias}$	1.40e-07
$k_{\theta,warp}$	1.32e-07



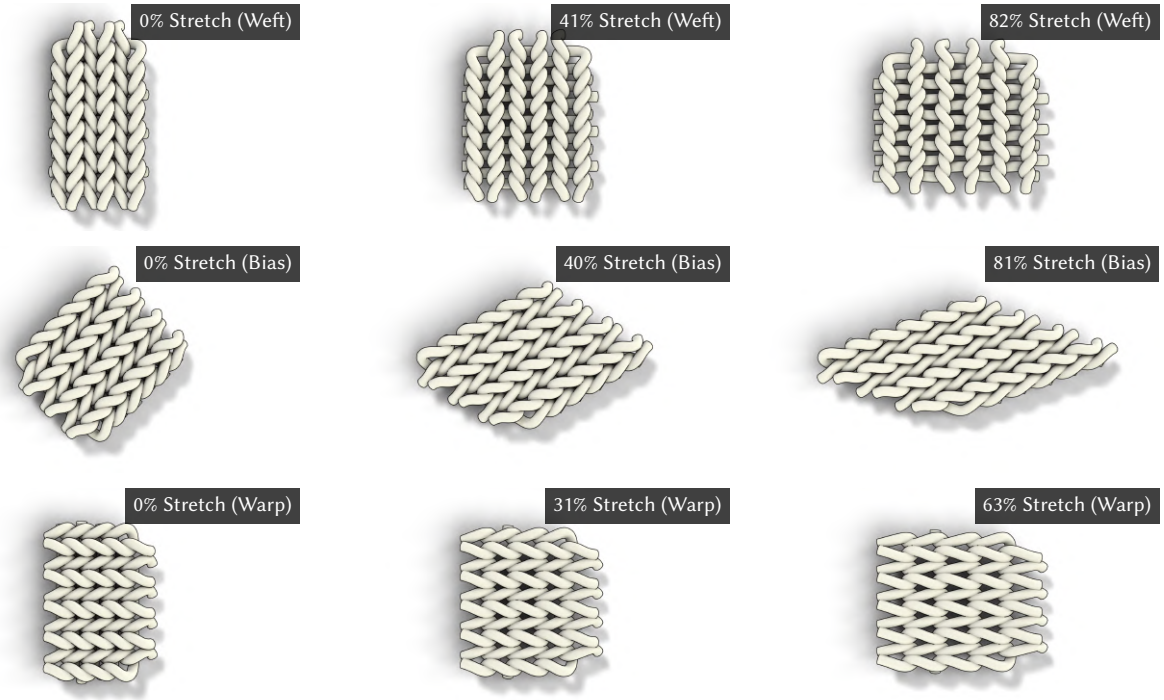
Yarn-Level Fit

Fitting error	%
Comfort Stretch	8
Full Stretch	26
Compression	16
Bending Stiffness	49

Parameter	Value
k_{s1}	1.95e-01
$\bar{\varepsilon}_s$	1.46e-01
k_b	1.01e-10
R_1	6.61e-05
k_{c1}	9.76e+01
k_{s2}	1.03e+01
R_2	2.43e-05
k_{c2}	1.00e+03
R_{visual}	7.28e-05

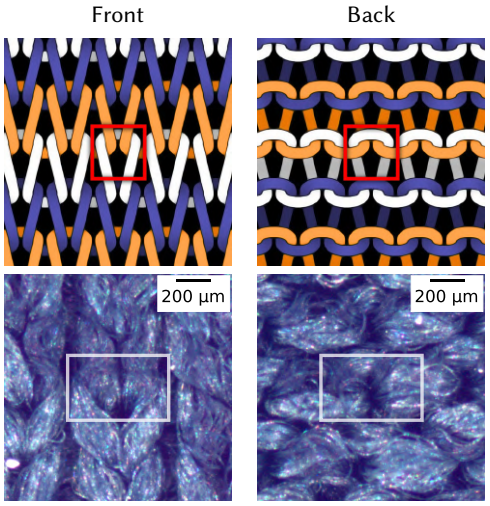


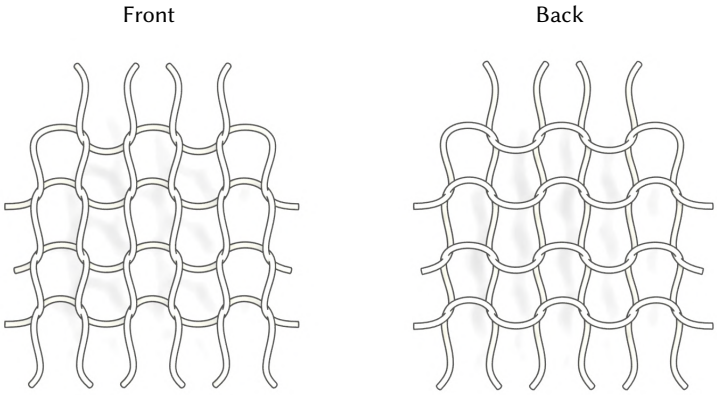
Yarn-Level Simulations



SJ10: SINGLE JERSEY

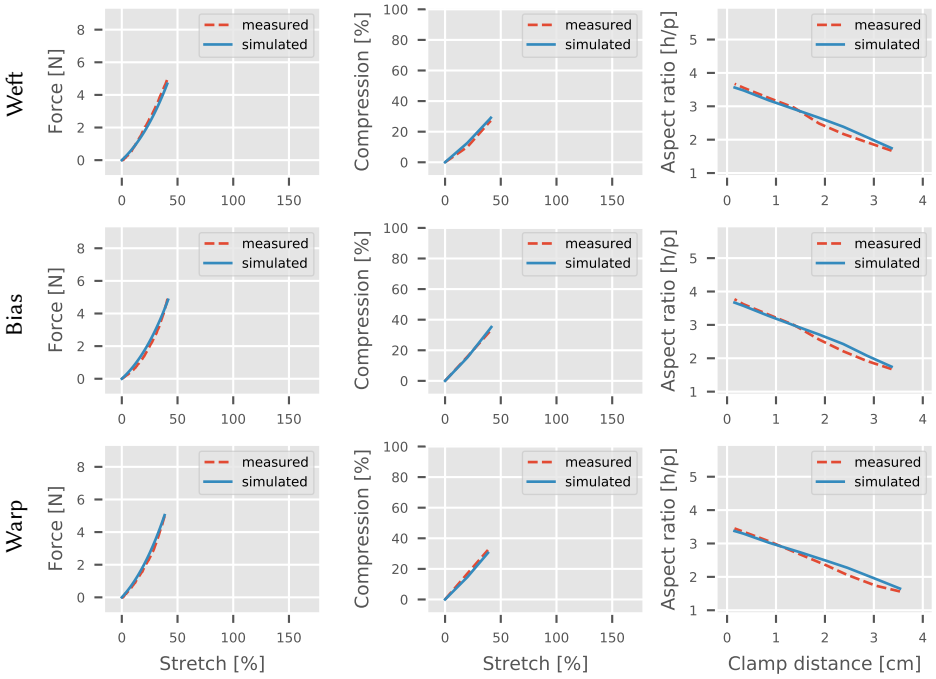
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
50D/34F Lycra T400	40	1	144	0.41	0.59×0.38	Anti-microbial
75D/96F Polyester	60	1				





Thin-Shell Fit

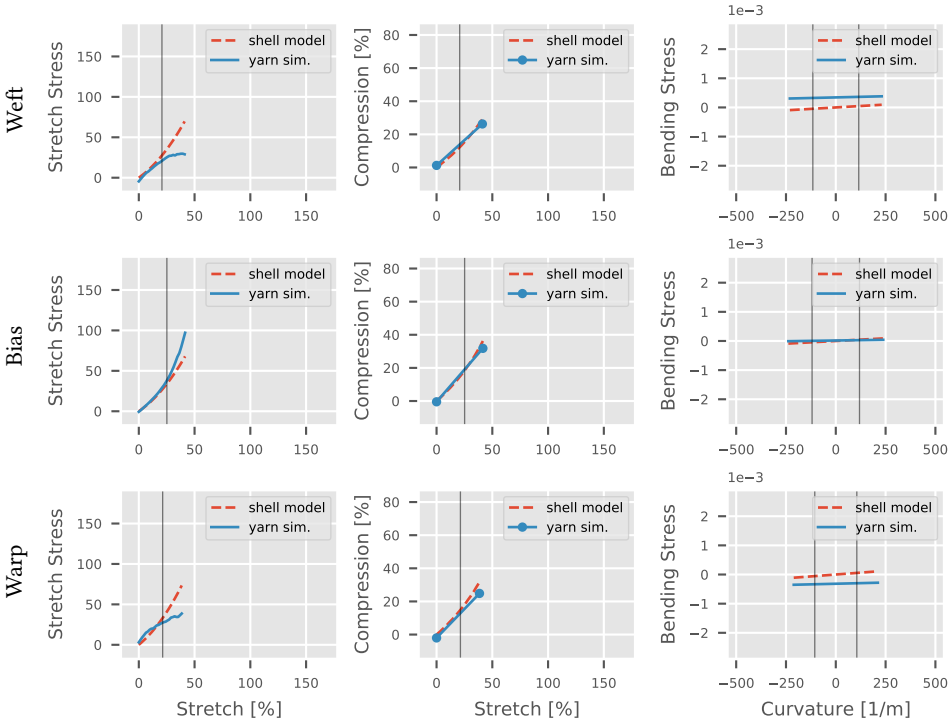
Parameter	Value
k_{xx}	1.41e+02
k_{xy}	8.20e+01
k_{yy}	1.63e+02
k_{ss}	3.01e+01
k_{n1}	0
k_{n2}	1.00e-05
$k_{\theta,weft}$	2.60e-07
$k_{\theta,bias}$	1.87e-07
$k_{\theta,warp}$	2.00e-07



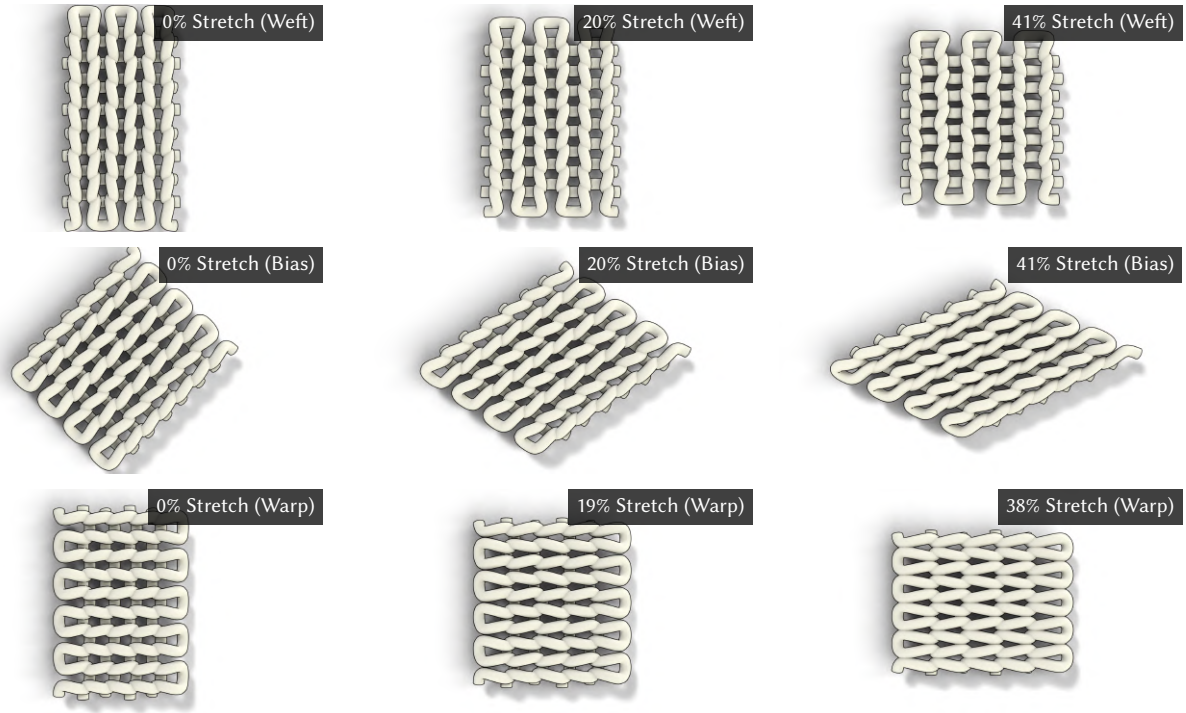
Yarn-Level Fit

Fitting error	%
Comfort Stretch	9
Full Stretch	39
Compression	10
Bending Stiffness	28

Parameter	Value
k_{s1}	1.06e+00
$\bar{\varepsilon}_s$	4.49e-03
k_b	2.34e-10
R_1	1.76e-04
k_{c1}	7.51e+00
k_{s2}	1.11e+01
R_2	2.93e-05
k_{c2}	1.00e+03
R_{visual}	9.24e-05

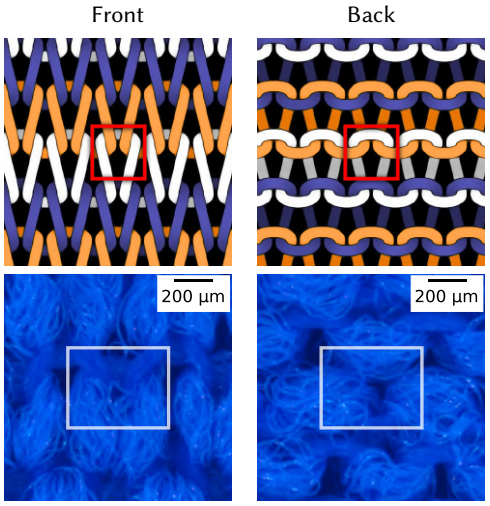


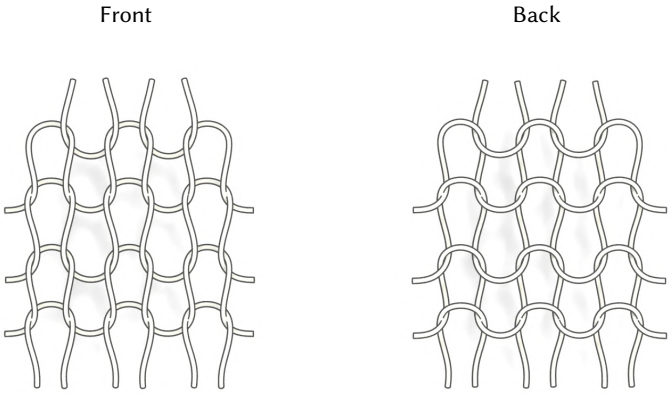
Yarn-Level Simulations



SJ11: SINGLE JERSEY

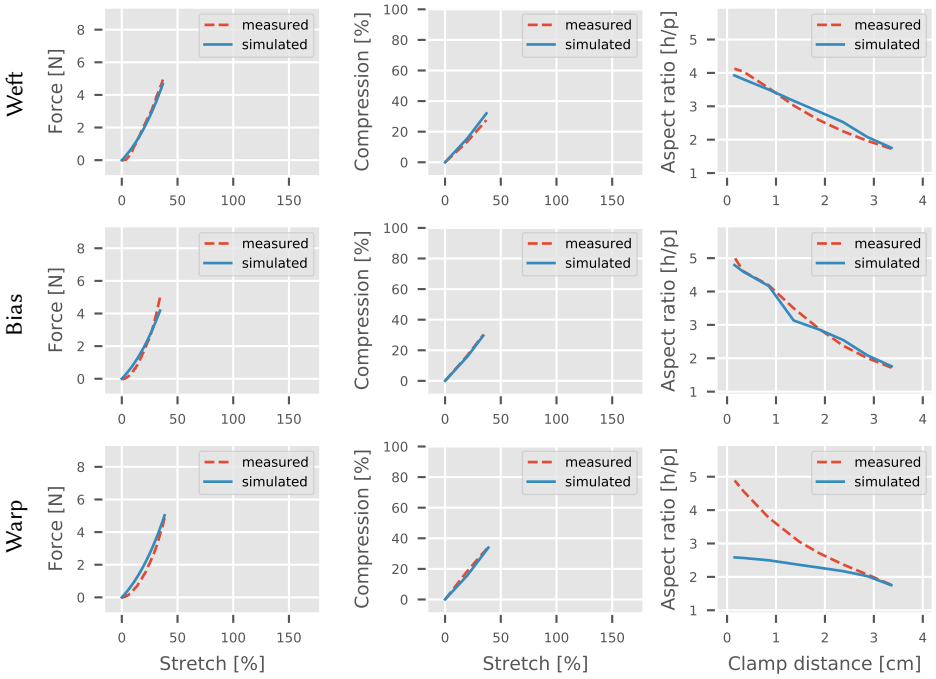
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
100D/72F Polyester Celliant	63	1	105	0.41	0.53 × 0.42	-
50D/72F Polyester	37	1				





Thin-Shell Fit

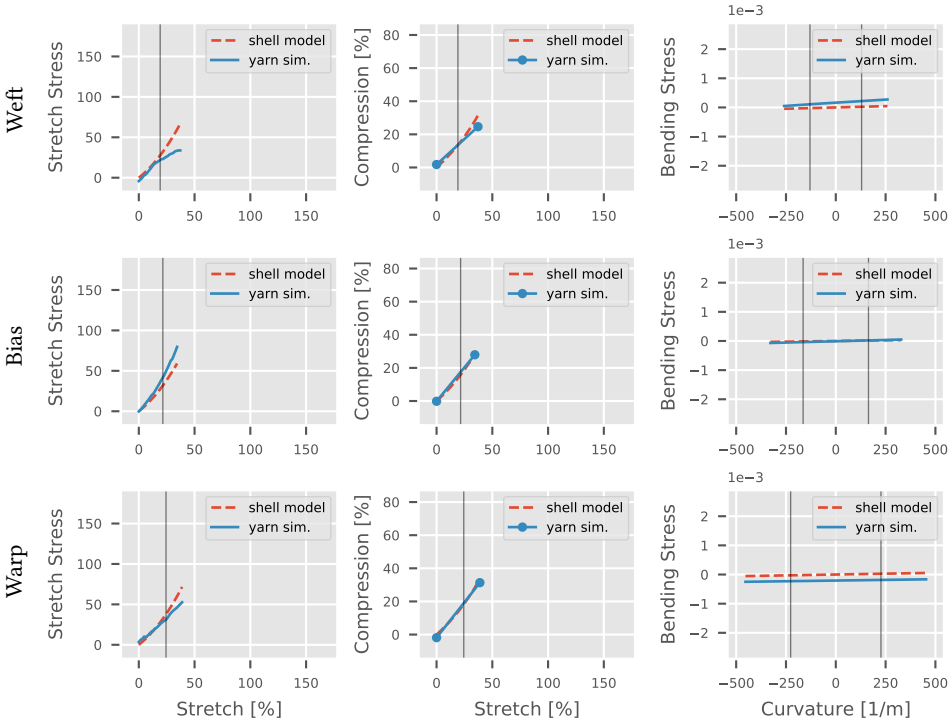
Parameter	Value
k_{xx}	1.74e+02
k_{xy}	1.05e+02
k_{yy}	1.75e+02
k_{ss}	3.40e+01
k_{n1}	0
k_{n2}	1.00e-05
$k_{\theta,weft}$	5.86e-08
$k_{\theta,bias}$	4.50e-08
$k_{\theta,warp}$	8.92e-08



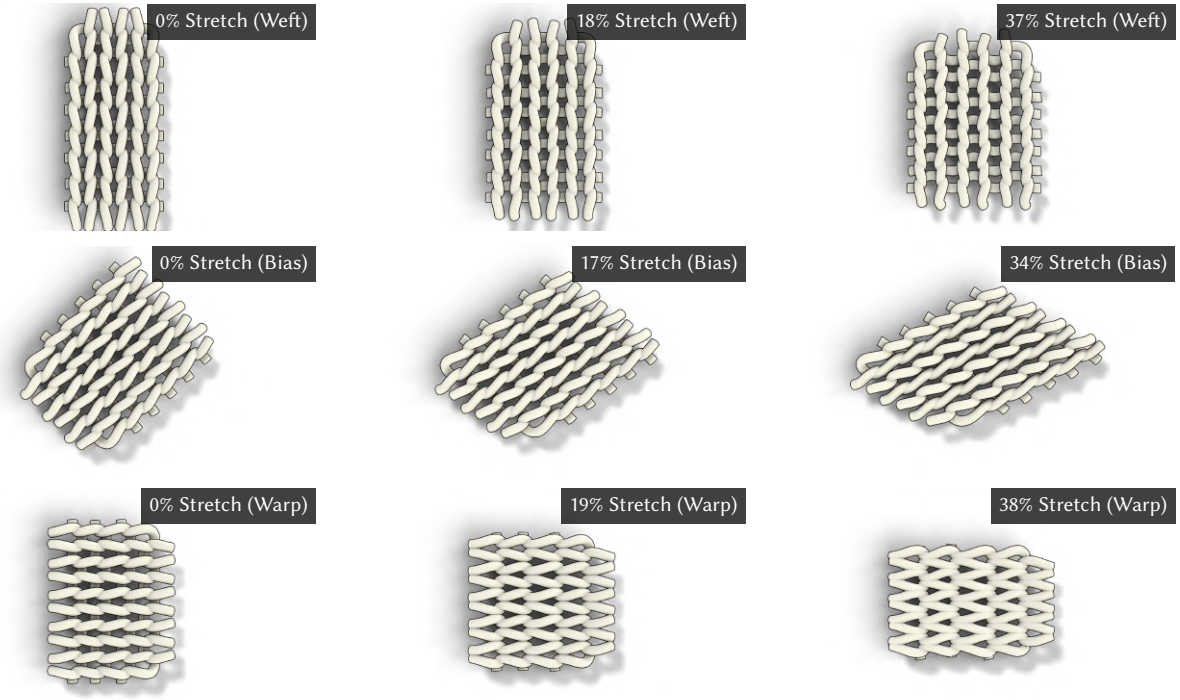
Yarn-Level Fit

Fitting error	%
Comfort Stretch	10
Full Stretch	28
Compression	9
Bending Stiffness	187

Parameter	Value
k_{s1}	1.33e+00
$\bar{\varepsilon}_s$	9.03e-02
k_b	9.64e-10
R_1	1.73e-04
k_{c1}	2.54e+00
k_{s2}	8.33e+00
R_2	2.93e-05
k_{c2}	1.00e+03
R_{visual}	8.47e-05

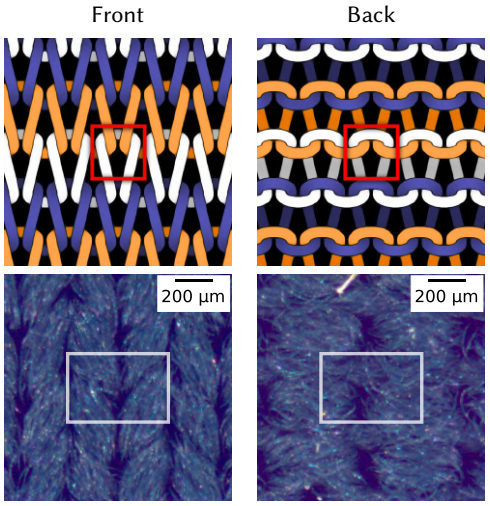


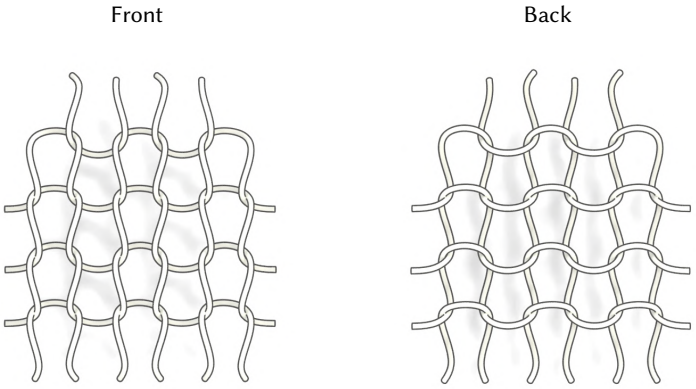
Yarn-Level Simulations



SJ12: SINGLE JERSEY

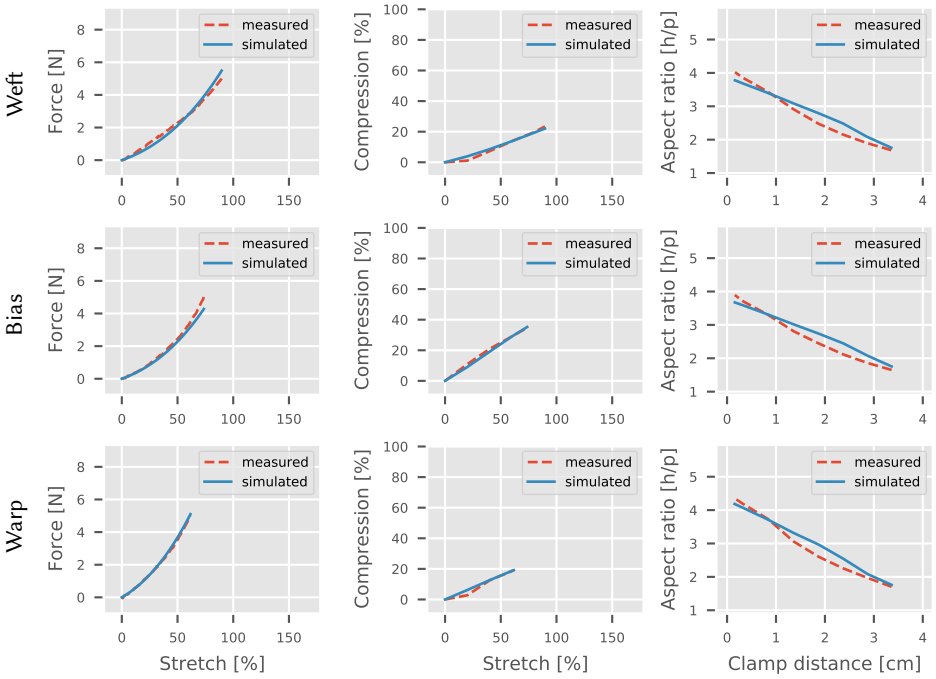
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
100D/144F Polyester	88	1	182	0.53	0.53 × 0.36	Anti-microbial
40D Spandex	12	1				





Thin-Shell Fit

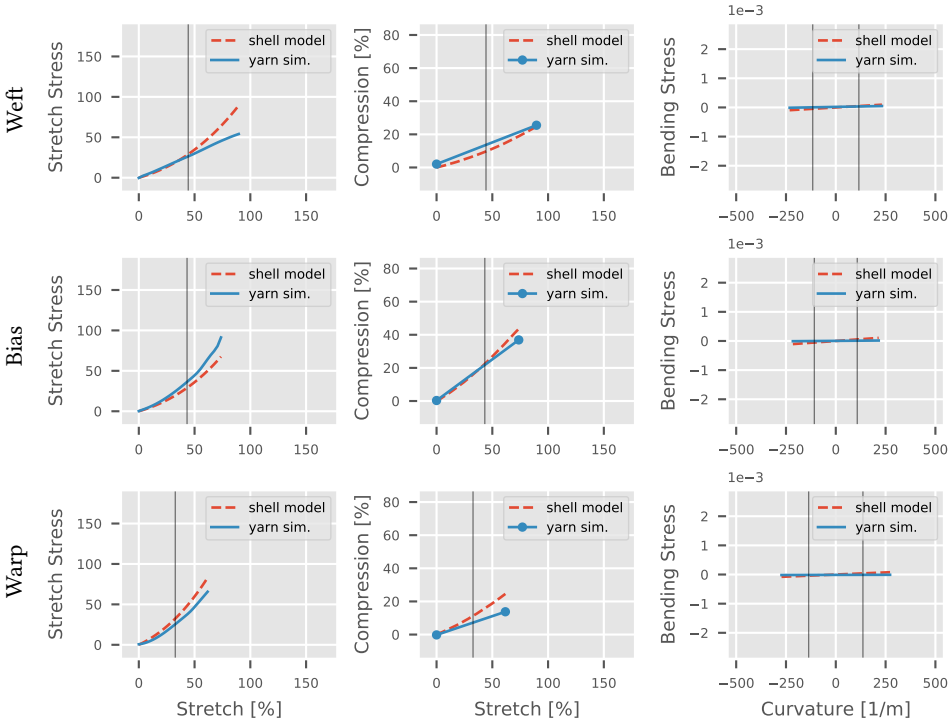
Parameter	Value
k_{xx}	3.70e+01
k_{xy}	7.54e+00
k_{yy}	6.51e+01
k_{ss}	1.43e+01
k_{n1}	2.00e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	1.44e-07
$k_{\theta,bias}$	2.46e-07
$k_{\theta,warp}$	2.03e-07



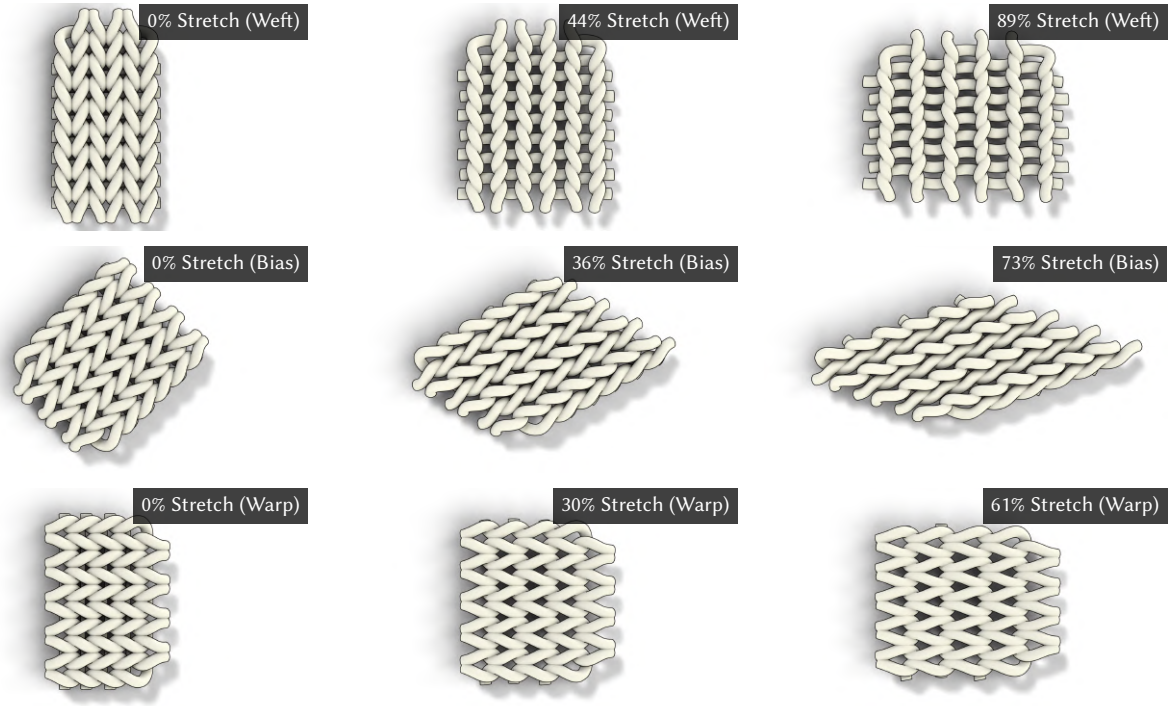
Yarn-Level Fit

Fitting error	%
Comfort Stretch	9
Full Stretch	32
Compression	16
Bending Stiffness	54

Parameter	Value
k_{s1}	1.68e-01
$\bar{\varepsilon}_s$	5.95e-02
k_b	5.92e-10
R_1	7.05e-05
k_{c1}	7.50e+01
k_{s2}	1.21e+01
R_2	3.13e-05
k_{c2}	1.00e+03
R_{visual}	8.95e-05

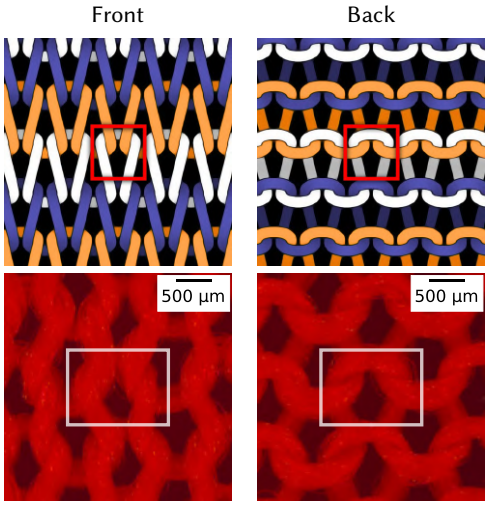


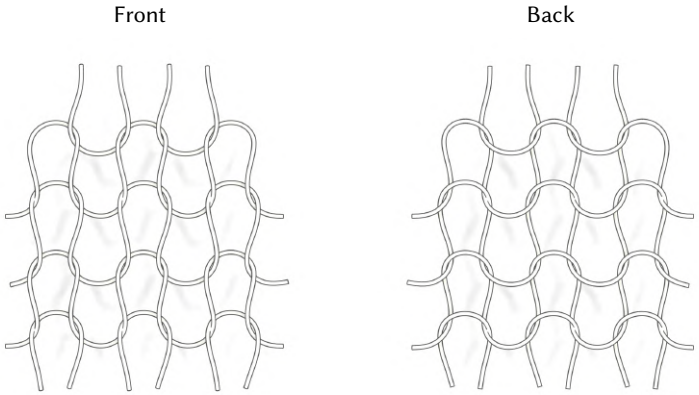
Yarn-Level Simulations



SJ13: SINGLE JERSEY

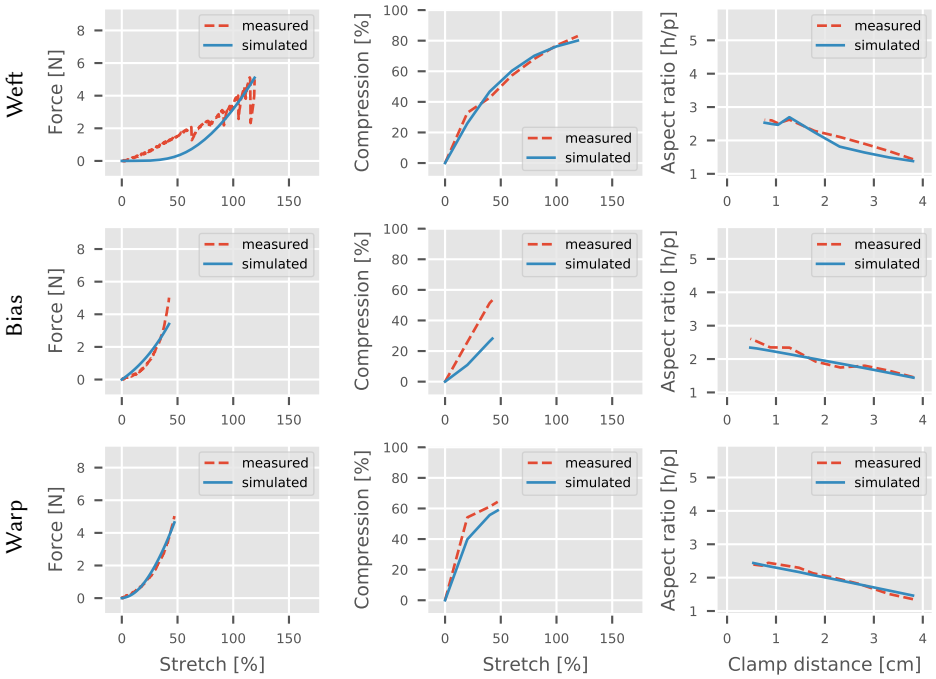
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	2	112	0.45	1.42×1.06	-





Thin-Shell Fit

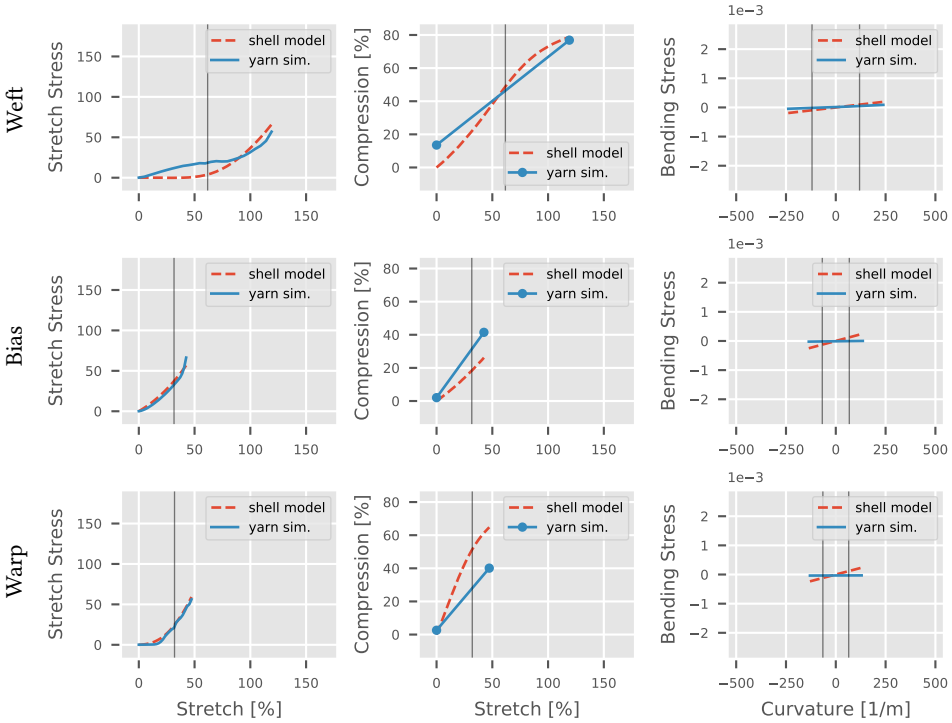
Parameter	Value
k_{xx}	3.13e+01
k_{xy}	6.02e+01
k_{yy}	1.16e+02
k_{ss}	2.74e+01
k_{n1}	5.34e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	9.03e-07
$k_{\theta,bias}$	9.21e-07
$k_{\theta,warp}$	4.01e-07



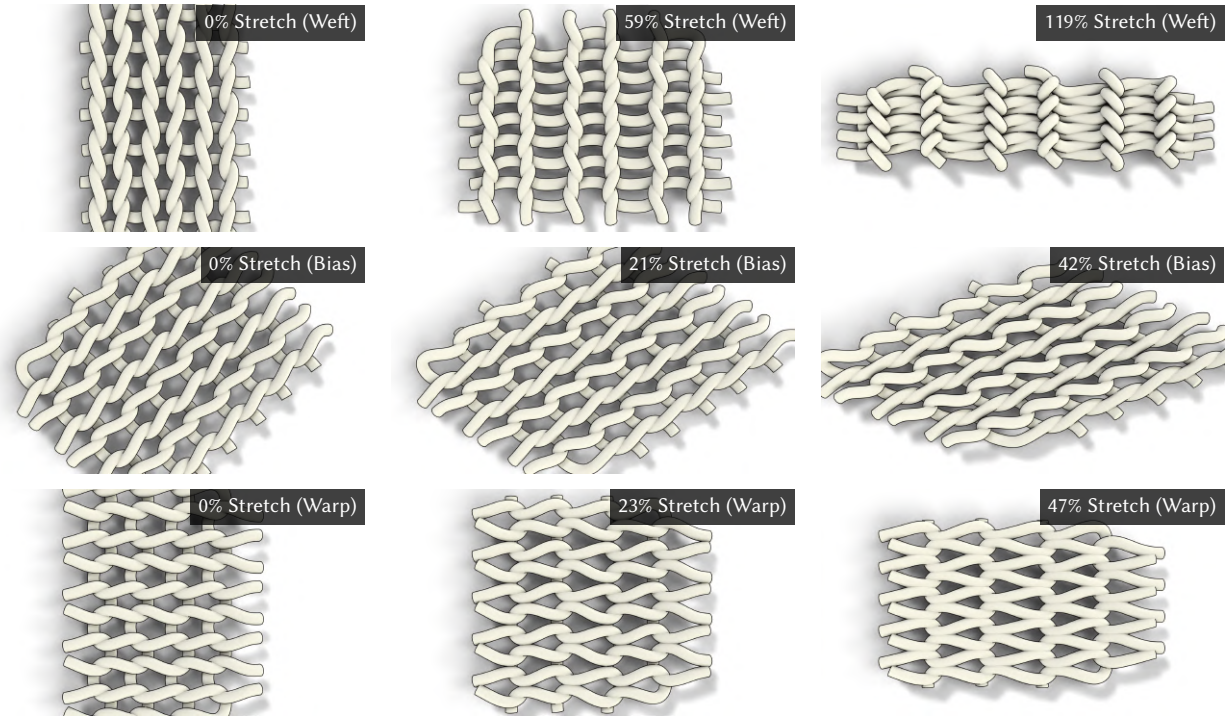
Yarn-Level Fit

Fitting error	%
Comfort Stretch	15
Full Stretch	14
Compression	23
Bending Stiffness	66

Parameter	Value
k_{s1}	3.75e-01
$\bar{\varepsilon}_s$	7.25e-02
k_b	3.77e-09
R_1	2.45e-04
k_{c1}	1.52e-01
k_{s2}	1.85e+01
R_2	7.57e-05
k_{c2}	1.00e+03
R_{visual}	1.60e-04

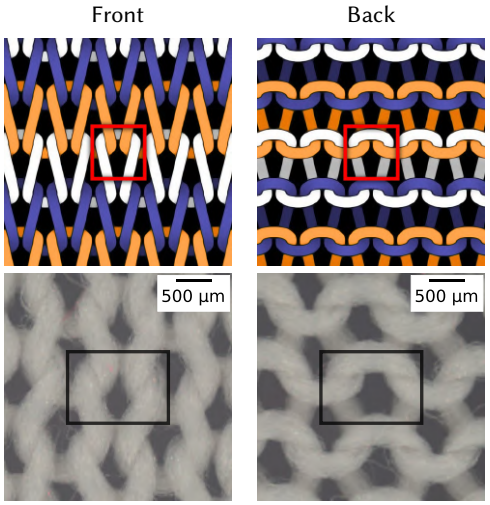


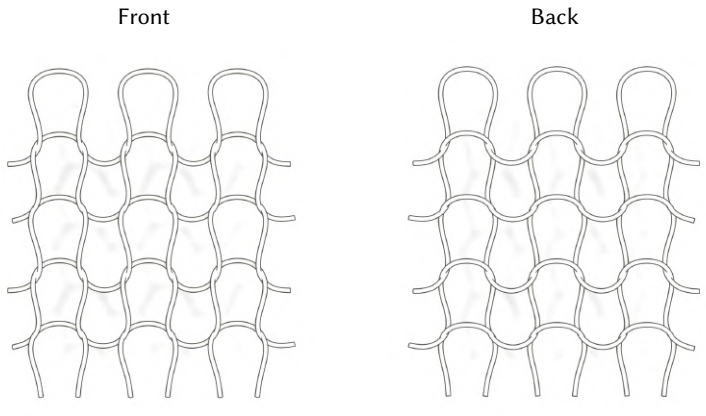
Yarn-Level Simulations



SJ14: SINGLE JERSEY

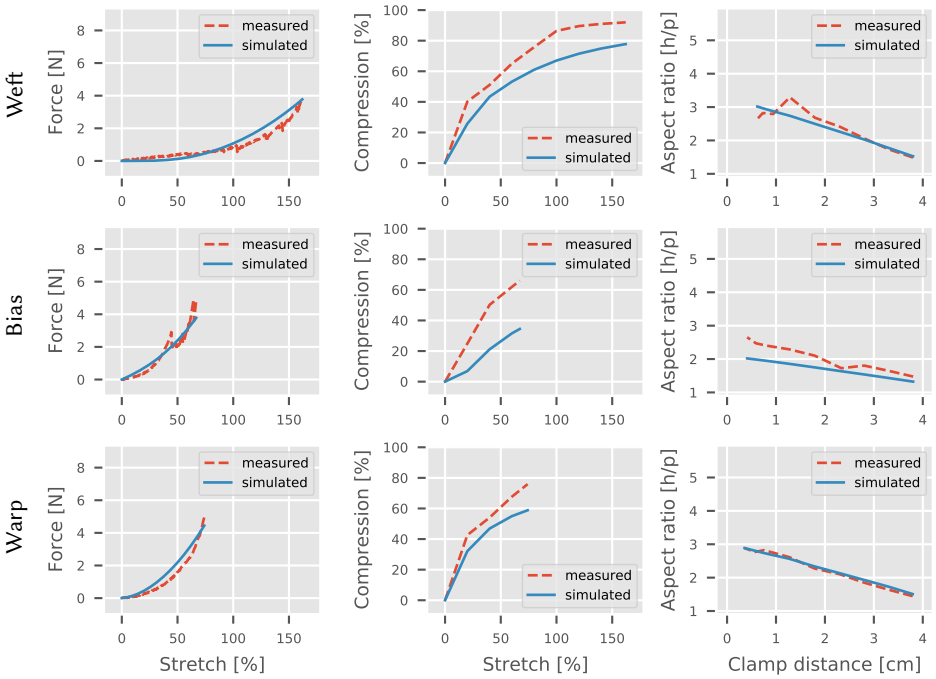
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
75D/72F Polyester	100	4	93	0.43	1.41×1.00	-





Thin-Shell Fit

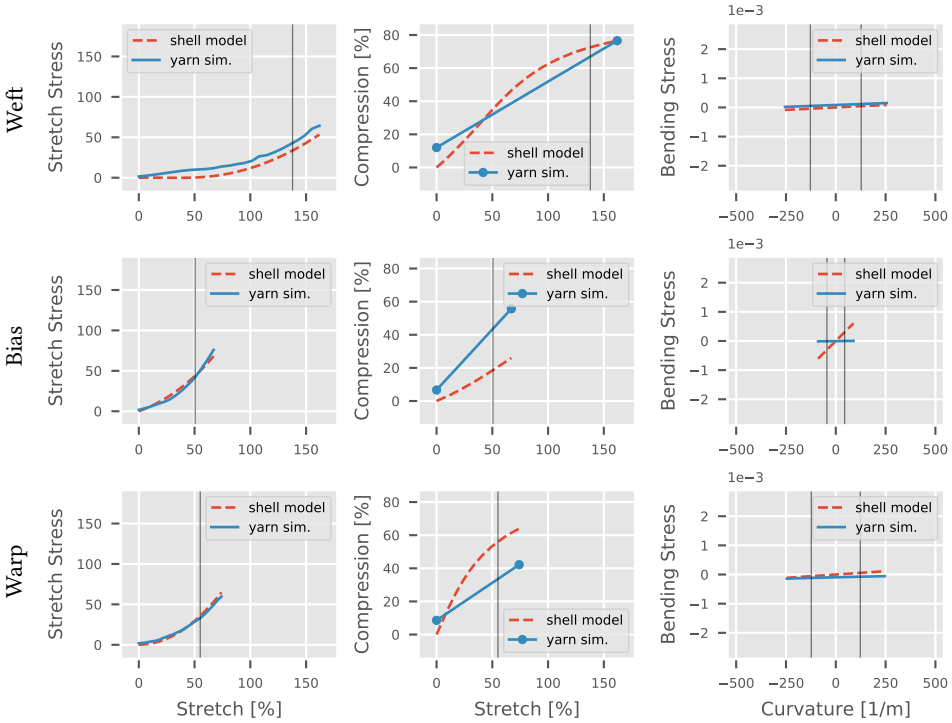
Parameter	Value
k_{xx}	1.07e+01
k_{xy}	2.24e+01
k_{yy}	4.70e+01
k_{ss}	2.01e+01
k_{n1}	5.08e+00
k_{n2}	1.00e-05
$k_{\theta,weft}$	2.29e-07
$k_{\theta,bias}$	3.42e-06
$k_{\theta,warp}$	1.65e-07



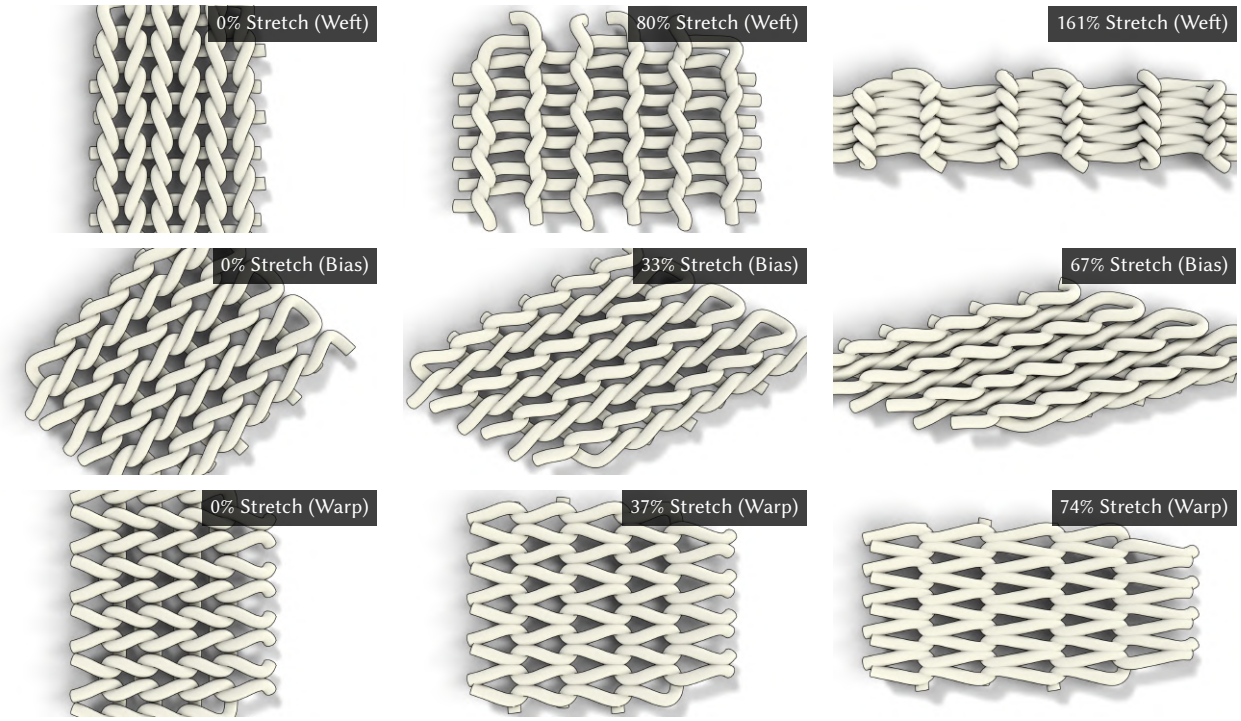
Yarn-Level Fit

Fitting error	%
Comfort Stretch	10
Full Stretch	11
Compression	21
Bending Stiffness	33

Parameter	Value
k_{s1}	3.82e-01
$\bar{\varepsilon}_s$	1.50e-01
k_b	2.35e-09
R_1	1.37e-04
k_{c1}	1.67e+01
k_{s2}	1.03e+01
R_2	6.87e-05
k_{c2}	1.00e+03
R_{visual}	1.71e-04

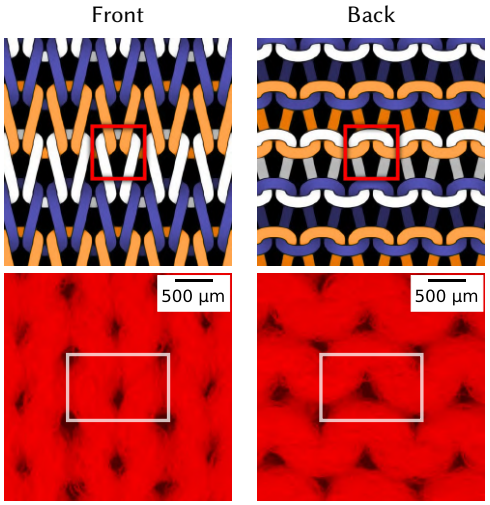


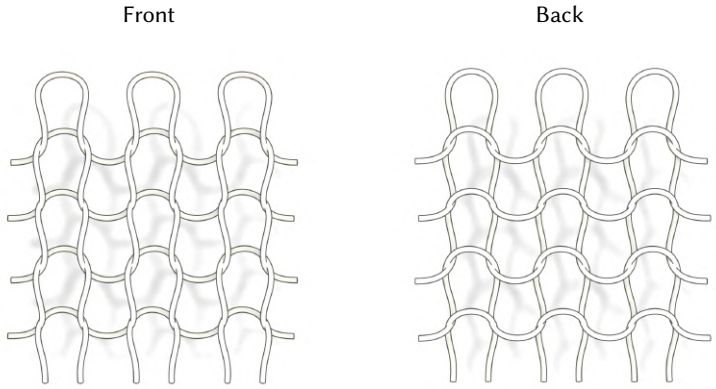
Yarn-Level Simulations



SJ15: SINGLE JERSEY

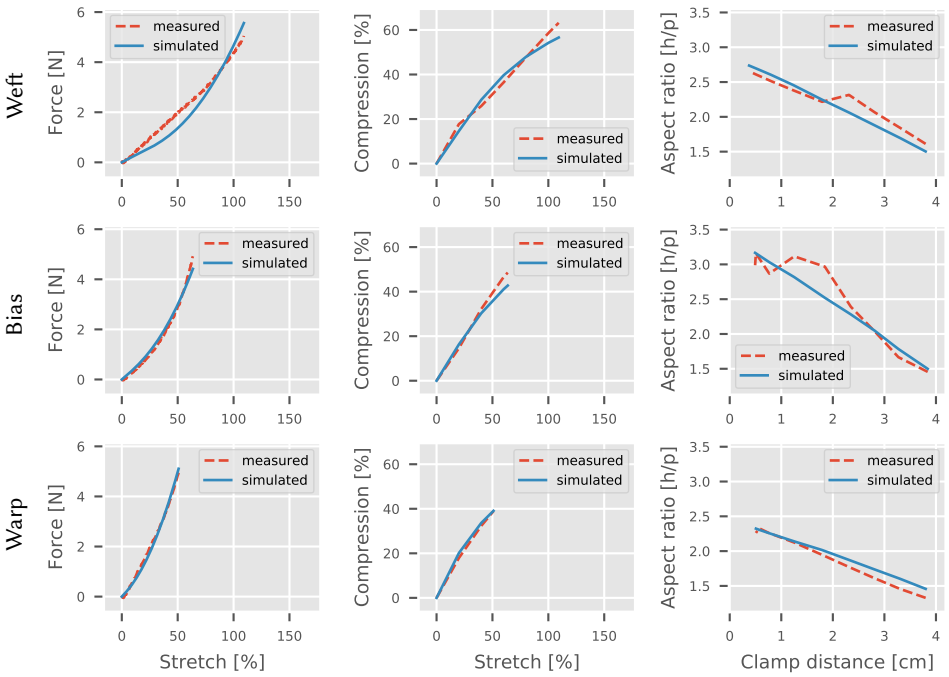
Yarn	%	Threads	Density $[g/m^2]$	Thickness [mm]	Repeat size [mm]	Finishes
150D/72F Polyester	100	3	160	0.66	1.34×0.87	-





Thin-Shell Fit

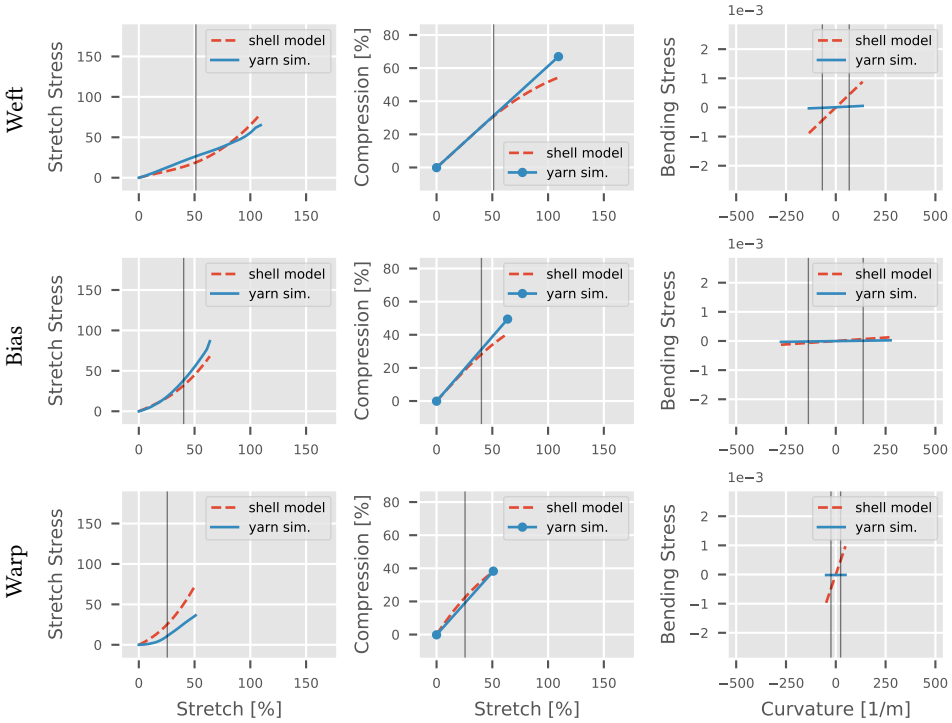
Parameter	Value
k_{xx}	2.96e+01
k_{xy}	2.95e+01
k_{yy}	9.40e+01
k_{ss}	1.60e+01
k_{n1}	1.39e+01
k_{n2}	1.56e+01
$k_{\theta,weft}$	2.10e-06
$k_{\theta,bias}$	2.84e-07
$k_{\theta,warp}$	6.32e-07



Yarn-Level Fit

Fitting error	%
Comfort Stretch	17
Full Stretch	34
Compression	12
Bending Stiffness	43

Parameter	Value
k_{s1}	2.86e-01
$\bar{\varepsilon}_s$	1.49e-01
k_b	3.18e-09
R_1	4.45e-04
k_{c1}	3.81e-02
k_{s2}	1.85e+01
R_2	7.41e-05
k_{c2}	1.00e+03
R_{visual}	2.00e-04



Yarn-Level Simulations