

# Practical Methods to Estimate Fabric Mechanics from Metadata - Supplementary Material

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## 1. Model Implementation Details

For training both models, **MECHMET** and **MECHIM**, we used the Mean Absolute Error of the parameters as the loss function, and a different set of hyper-parameters for the *bending* and *stretch* models. For **MECHMET**, which is a Random Forest Regressor (RFR), we did 5-fold cross validation to find, for stretch: `min_samples_leaf=0.0148`, `min_samples_split=0.0455`, `max_depth=10`, `n_estimators=100`, `max_features=0.3`. For bending: `min_samples_leaf=0.0045`, `min_samples_split=0.0055`, `max_depth=10`, `n_estimators=100`, `max_features=0.3`. Training both models takes a few seconds. For **MECHIM**, we use a ResNET18 [HZRS15] as feature extractor and the following sizes for the architecture components. For stretch: MLP layers=2, `size_of_each_layer=5` with an `input_size=meta_size*positional_encoding + FC_size + composition_embedding_size`. The size of the layers was progressively halved until reaching the last layer, which has an output size of 3 (the three stretch parameters). For bending, MLP layers=5, `size_of_each_layers=4` and the `input_size` and `size_of_the_layers` follows the same pattern as the MLP for stretch. The FC layer size is 5 for both models. The compositions were reduced using an MLP with 5 layers for stretch and 4 layers for bending. The size of the layers was also progressively halved until reaching the last layer, which has a size of 2. We used Adam optimizer with learning rates of 0.001 and 0.08 for stretch and bending models, and a learning rate decay of 0.78 for both models. For training the neural network we used crops of the images of size 256x256 and performed data augmentation by random perturbations of small rotations, gaussian blurs, and changes of saturation, contrast, and color. The training was done with a GeForce RTX 2080 Ti during approximately 150 epochs (about 20 minutes).

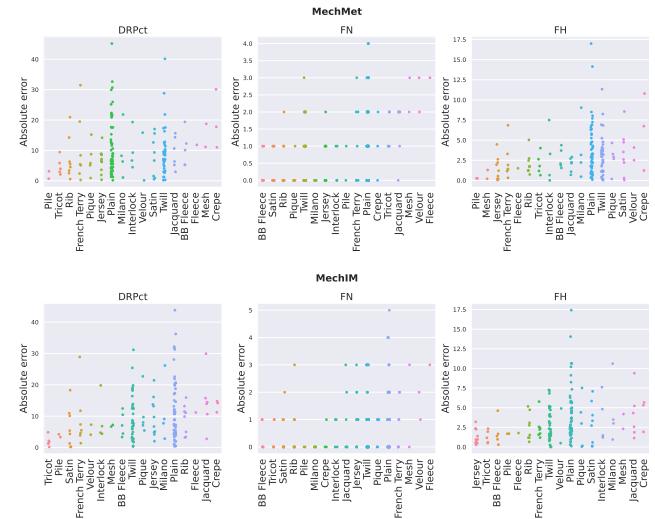
## 2. Cusick Results

In this section we show some extra results regarding the quantitative and qualitative performance of our models in the Cusick metric space.

### 2.1. Cusick Quantitative Results

In Figure 1 we evaluate the error in the Cusick metrics per family. As explained in the main document, Twill and Plain families have

the highest variability of errors, because they group lot of smaller categories of fabrics. Also in this case both models struggle with families that are under represented in our dataset, like Crepe or Fleece.



**Figure 1:** (this figure is new) Absolute errors of DRPct, FN and FH of all the fabrics per family, sorted by increasing mean family error.

### 2.2. Cusick Qualitative Results

In the following pages we show a set of digitized fabrics from our test set sorted by the error of the Drape Coefficient (DRPct) in increasing order. Each figure contains drapes of the Ground Truth (left), the **MECHMET** model (middle), and the **MECHIM** model (right).

**ID-01022**

Knit - Jersey  
Composition: 95% viscose rayon, 5% elastane  
Thickness: 0.45 mm; Weight: 199 gsm

**ID-20004**

Knit - Jersey  
Composition: 88% polyester, 12% hemp  
Thickness: 0.4 mm; Weight: 150 gsm

**ID-01047**

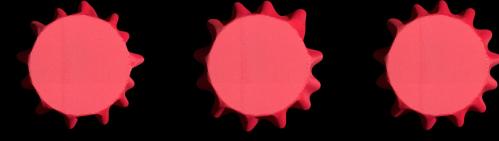
Knit - Jersey  
Composition: 95% viscose rayon, 5% elastane  
Thickness: 0.44 mm; Weight: 190 gsm

**ID-01025**

Knit - Jersey  
Composition: 95% viscose rayon, 5% elastane  
Thickness: 0.45 mm; Weight: 202 gsm

**ID-00321**

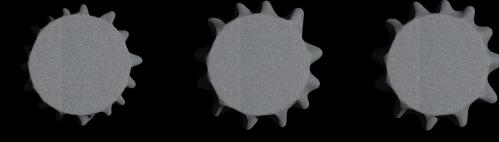
Knit - Interlock  
Composition: 100% modal  
Thickness: 0.29 mm; Weight: 150 gsm

**ID-00981**

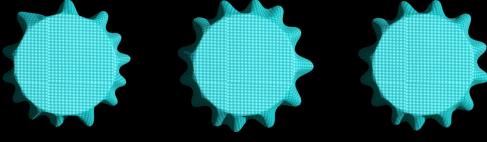
Knit - Interlock  
Composition: 100% viscose rayon  
Thickness: 0.31 mm; Weight: 111 gsm

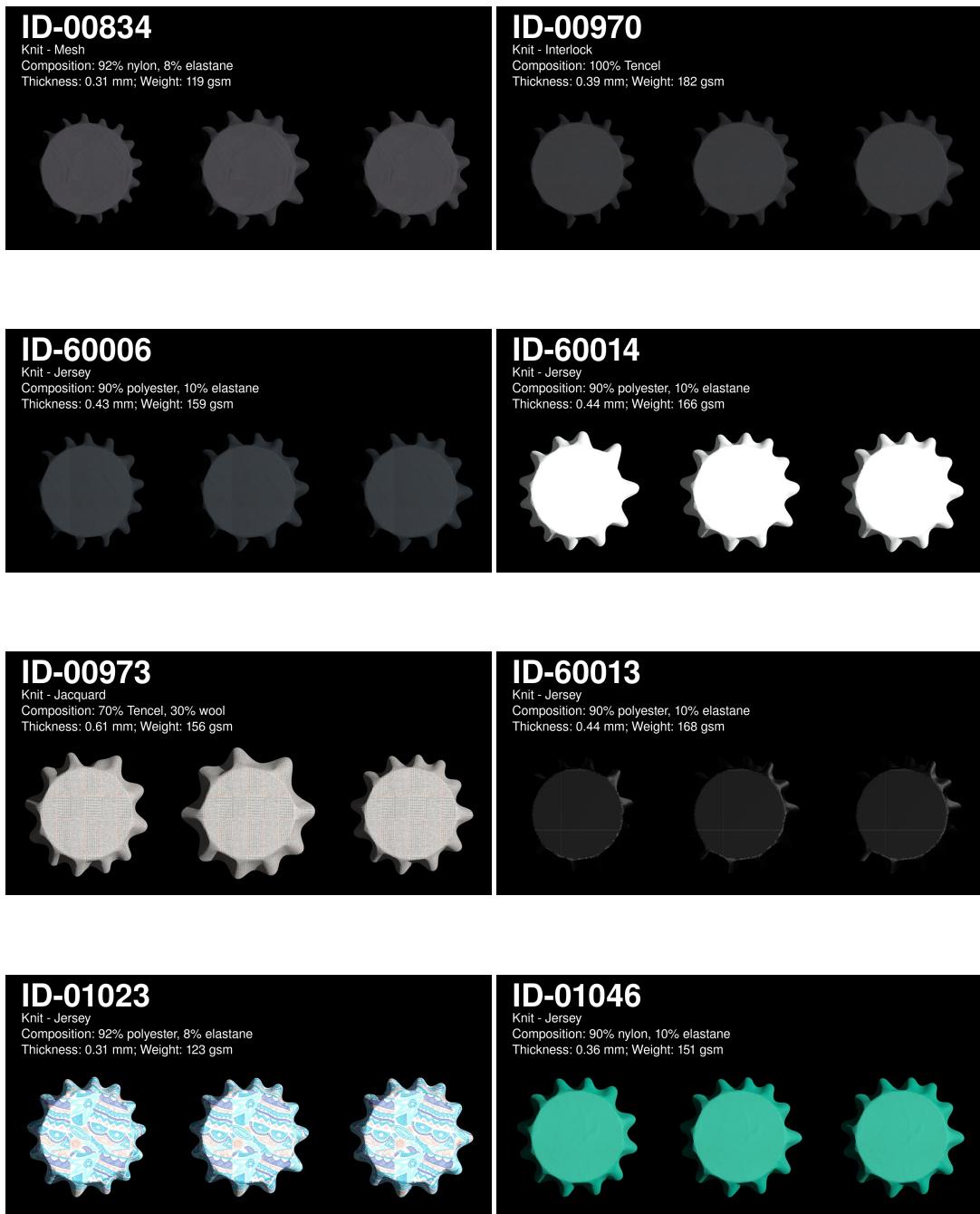
**ID-60022**

Knit - Interlock  
Composition: 100% CD  
Thickness: 0.42 mm; Weight: 127 gsm

**ID-01049**

Knit - Jersey  
Composition: 80% nylon, 20% elastane  
Thickness: 0.35 mm; Weight: 177 gsm





**ID-01037**

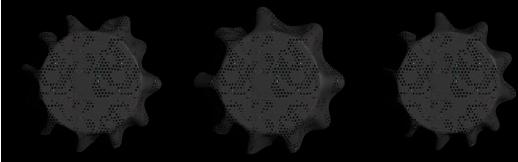
Knit - Velour  
Composition: 92% polyester, 8% elastane  
Thickness: 0.53 mm; Weight: 238 gsm

**ID-00979**

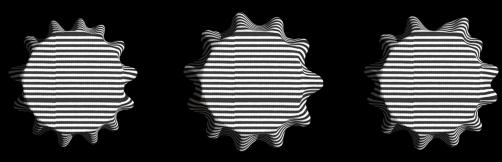
Knit - Jacquard  
Composition: 70% Tencel, 30% wool  
Thickness: 0.57 mm; Weight: 173 gsm

**ID-00914**

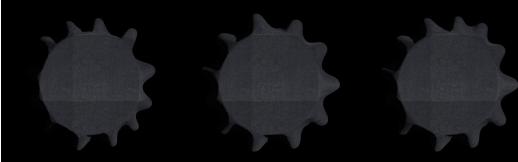
Knit - Mesh  
Composition: 93% polyester, 7% elastane  
Thickness: 0.55 mm; Weight: 175 gsm

**ID-00824**

Knit - Rib  
Composition: 50% viscose rayon, 45% polyester, 5% elastane  
Thickness: 0.52 mm; Weight: 217 gsm

**ID-00373**

Knit - Velour  
Composition: 92% polyester, 8% elastane  
Thickness: 0.53 mm; Weight: 207 gsm

**ID-60051**

Knit - French Terry  
Composition: 88% polyester, 12% elastane  
Thickness: 0.62 mm; Weight: 225 gsm

**ID-60009**

Knit - Jersey  
Composition: 80% polyester, 20% Lycra T400  
Thickness: 0.42 mm; Weight: 145 gsm

**ID-10024**

Knit - Jersey  
Composition: 60% cotton, 40% modal  
Thickness: 0.35 mm; Weight: 134 gsm





**ID-01033**

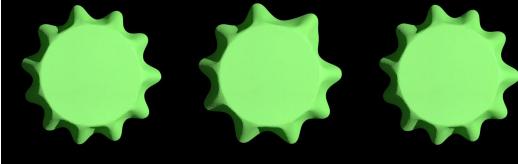
Knit - Tricot  
Composition: 82% nylon, 18% elastane  
Thickness: 0.6 mm; Weight: 197 gsm

**ID-01044**

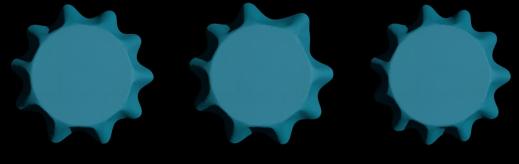
Knit - Jersey  
Composition: 95% organic cotton, 5% elastane  
Thickness: 0.43 mm; Weight: 174 gsm

**ID-01034**

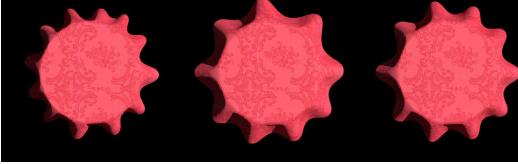
Knit - Tricot  
Composition: 82% nylon, 18% elastane  
Thickness: 0.61 mm; Weight: 204 gsm

**ID-01035**

Knit - Tricot  
Composition: 82% nylon, 18% elastane  
Thickness: 0.63 mm; Weight: 194 gsm

**ID-00982**

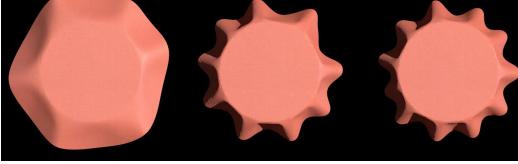
Knit - French Terry  
Composition: 65% viscose rayon, 32% cotton, 3% elastane  
Thickness: 0.65 mm; Weight: 251 gsm

**ID-01026**

Knit - Jersey  
Composition: 92% organic cotton, 8% elastane  
Thickness: 0.52 mm; Weight: 187 gsm

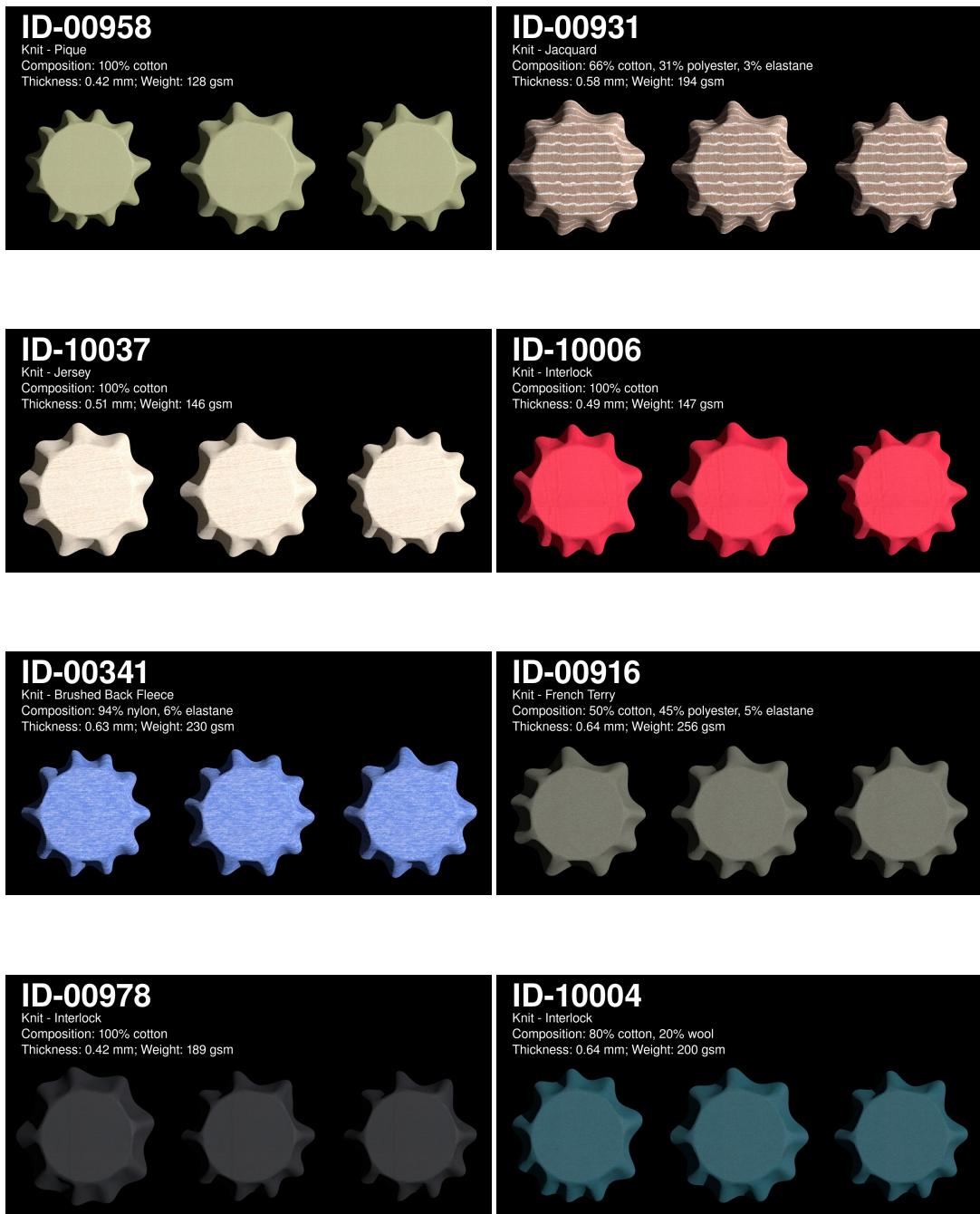
**ID-00957**

Knit - Pique  
Composition: 100% organic cotton  
Thickness: 0.43 mm; Weight: 181 gsm

**ID-10017**

Knit - Pique  
Composition: 100% cotton  
Thickness: 0.57 mm; Weight: 174 gsm





**ID-00803**

Knit - Rib  
Composition: 50% polyester, 50% cotton  
Thickness: 0.83 mm; Weight: 327 gsm

**ID-00841**

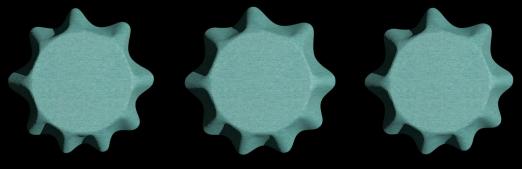
Knit - Milano  
Composition: 64% viscose rayon, 31% acrylic, 5% elastane  
Thickness: 0.63 mm; Weight: 248 gsm

**ID-00838**

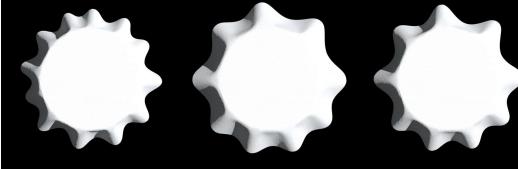
Knit - Milano  
Composition: 64% polyester, 31% acrylic, 5% elastane  
Thickness: 0.69 mm; Weight: 309 gsm

**ID-00971**

Knit - Interlock  
Composition: 45% polyester, 30% cotton, 15% flax, 8% nylon, 2% elastane  
Thickness: 0.62 mm; Weight: 174 gsm

**ID-50003**

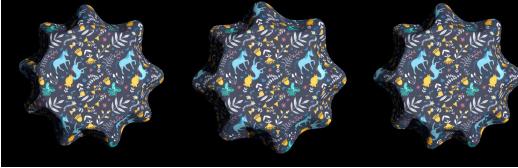
Knit - Mesh  
Composition: 100% polyester  
Thickness: 0.8 mm; Weight: 261 gsm

**ID-10026**

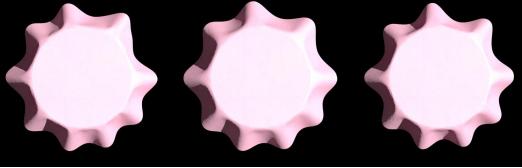
Knit - Rib  
Composition: 97% cotton, 3% elastane  
Thickness: 0.69 mm; Weight: 194 gsm

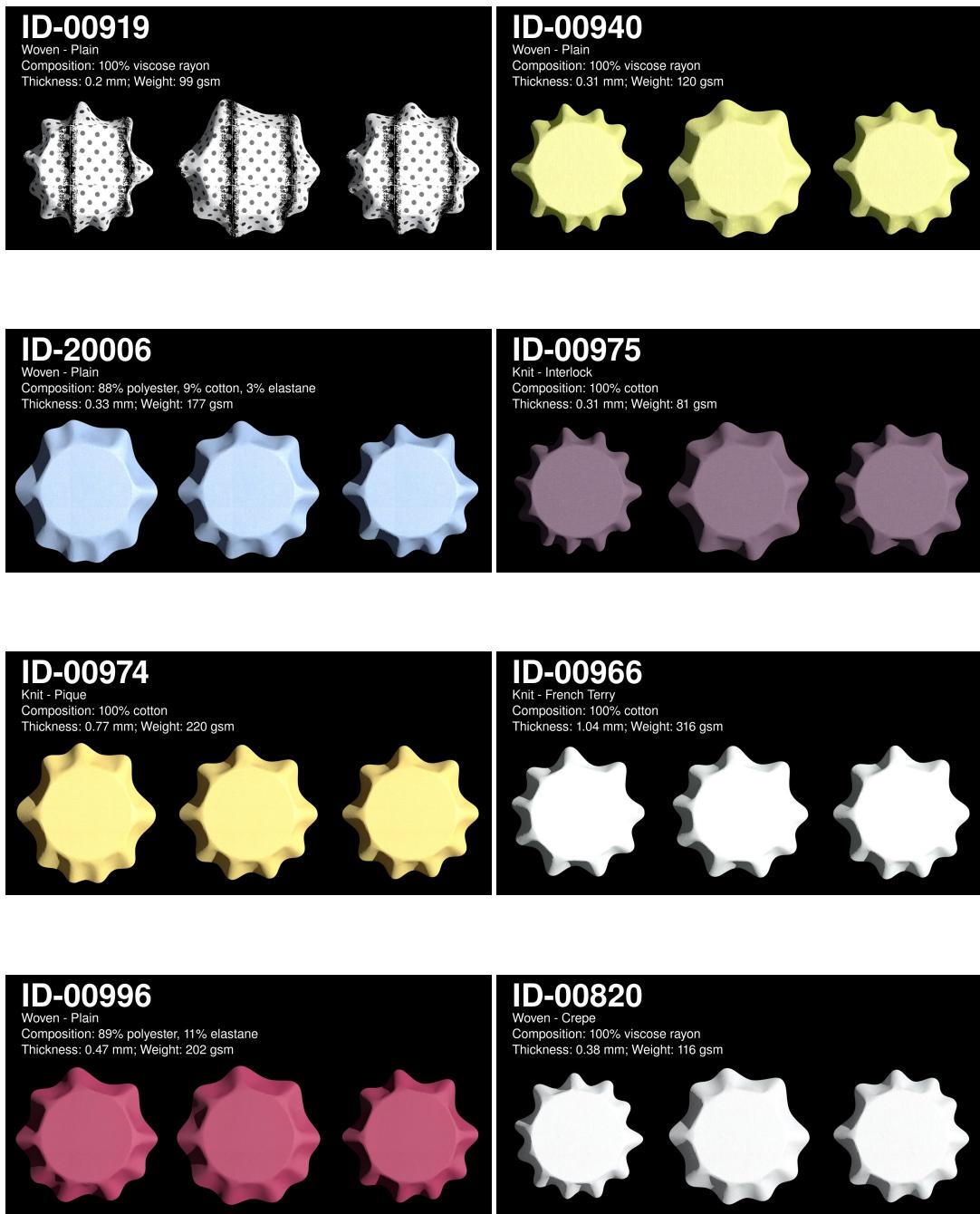
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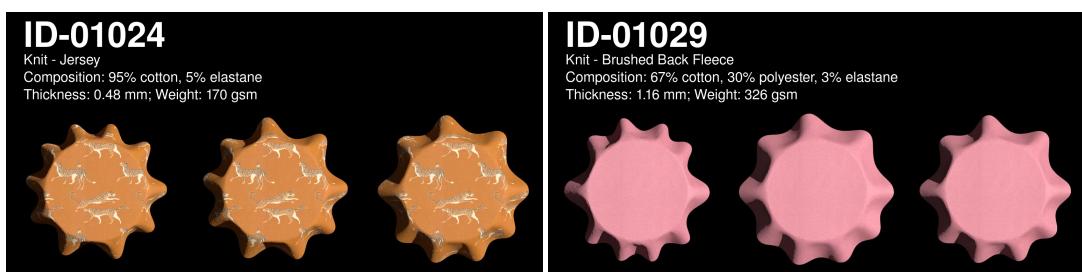
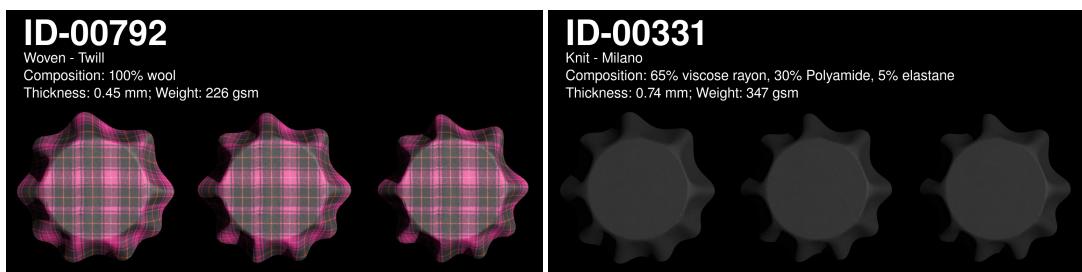
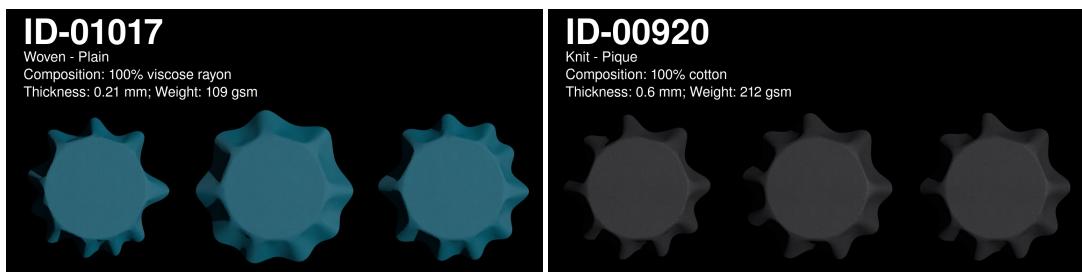
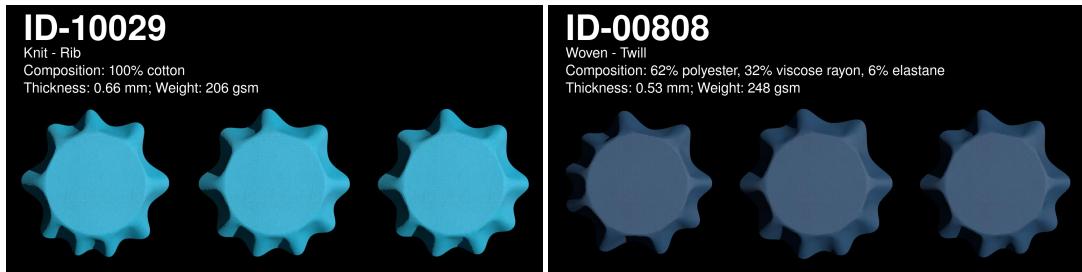
Knit - Brushed Back Fleece  
Composition: 95% cotton, 5% elastane  
Thickness: 0.68 mm; Weight: 232 gsm

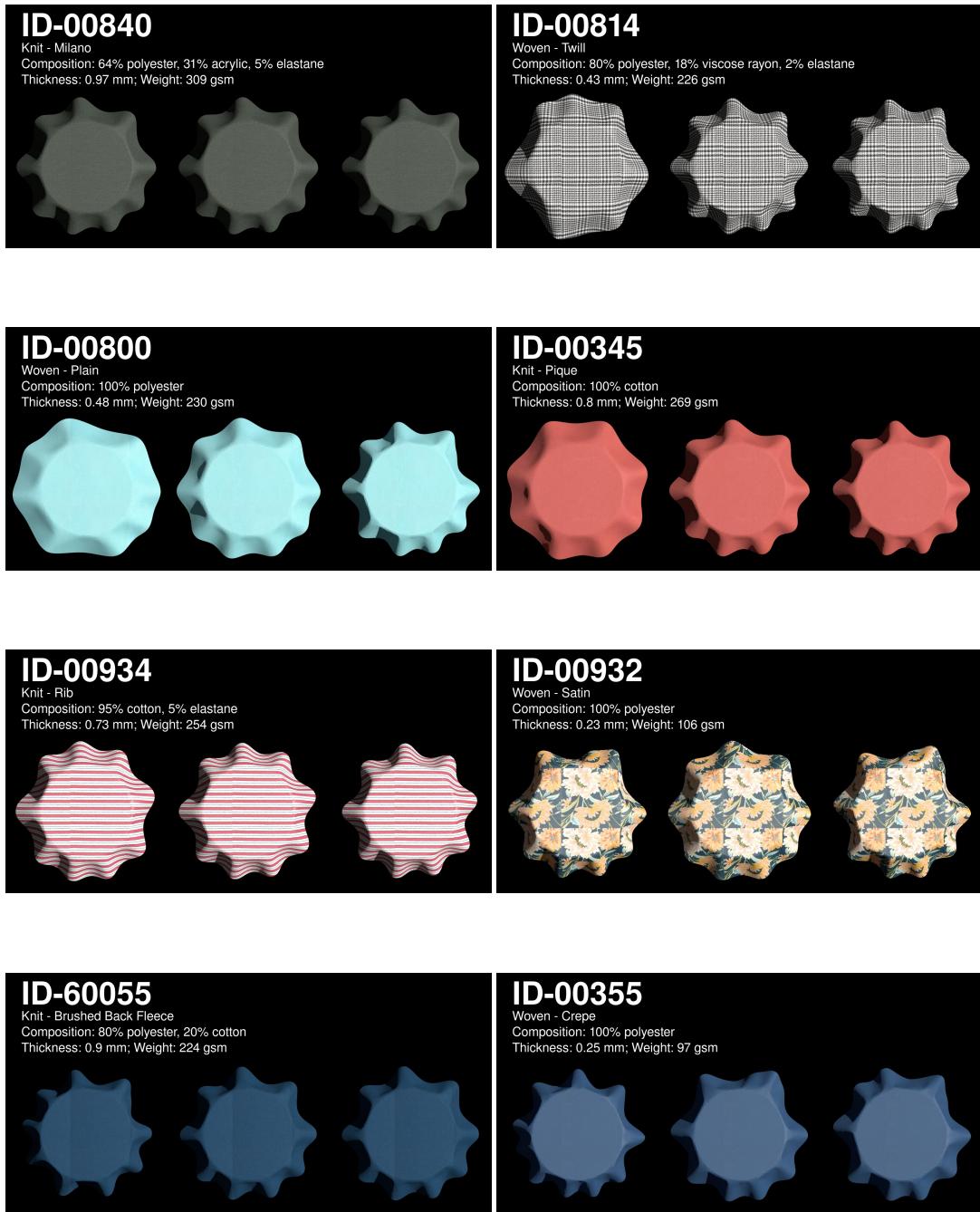
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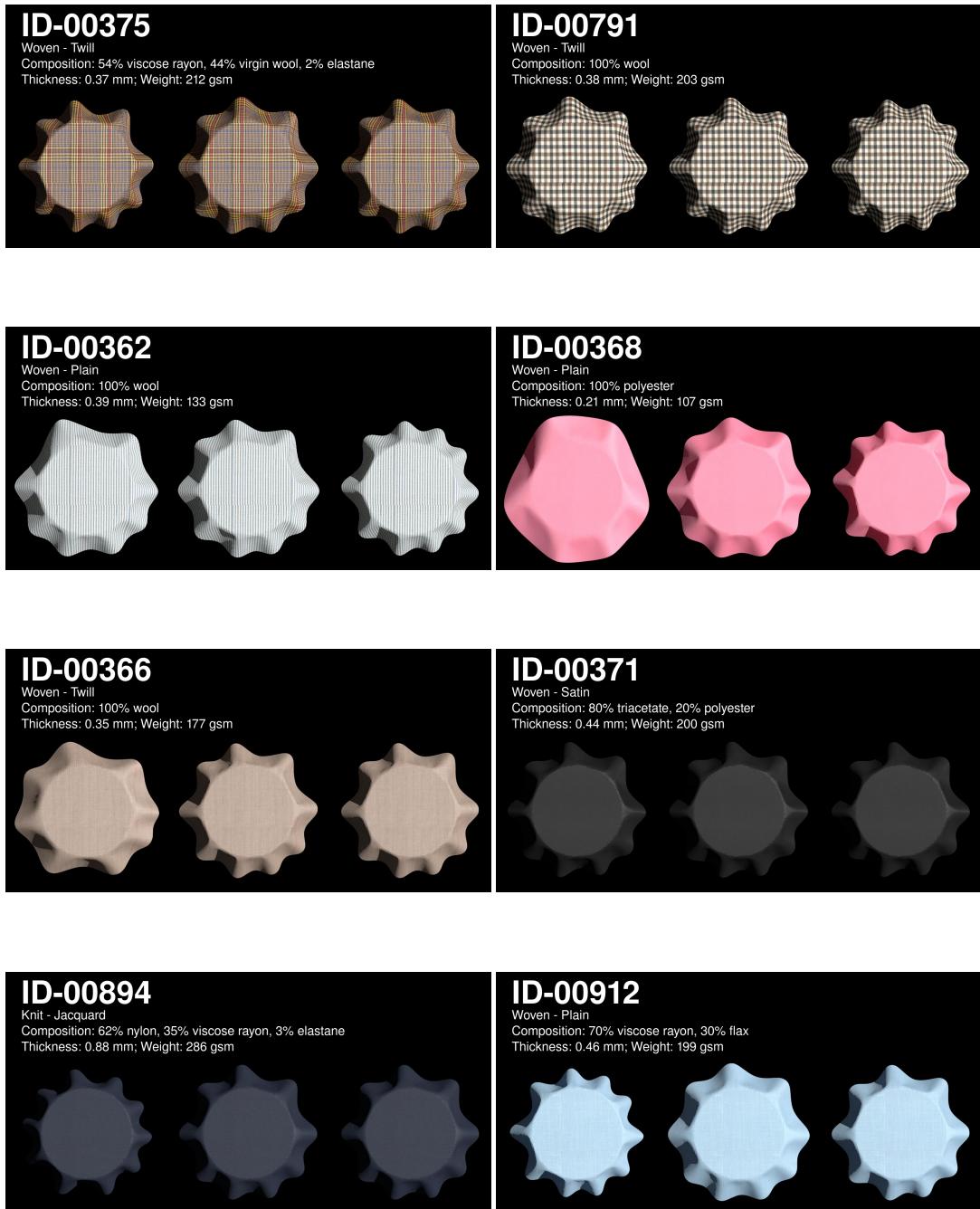
Knit - Brushed Back Fleece  
Composition: 50% polyester, 50% cotton  
Thickness: 1.08 mm; Weight: 259 gsm

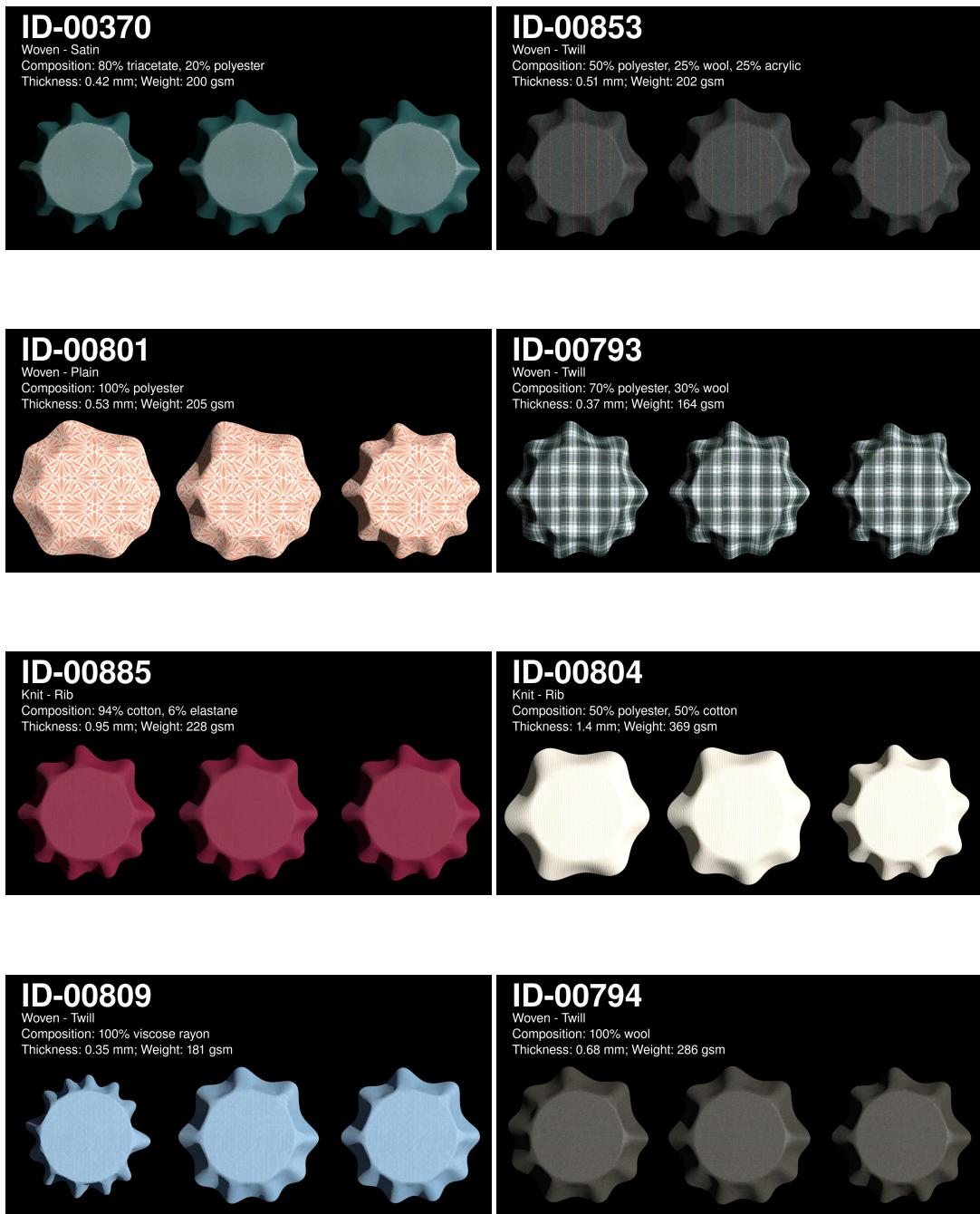


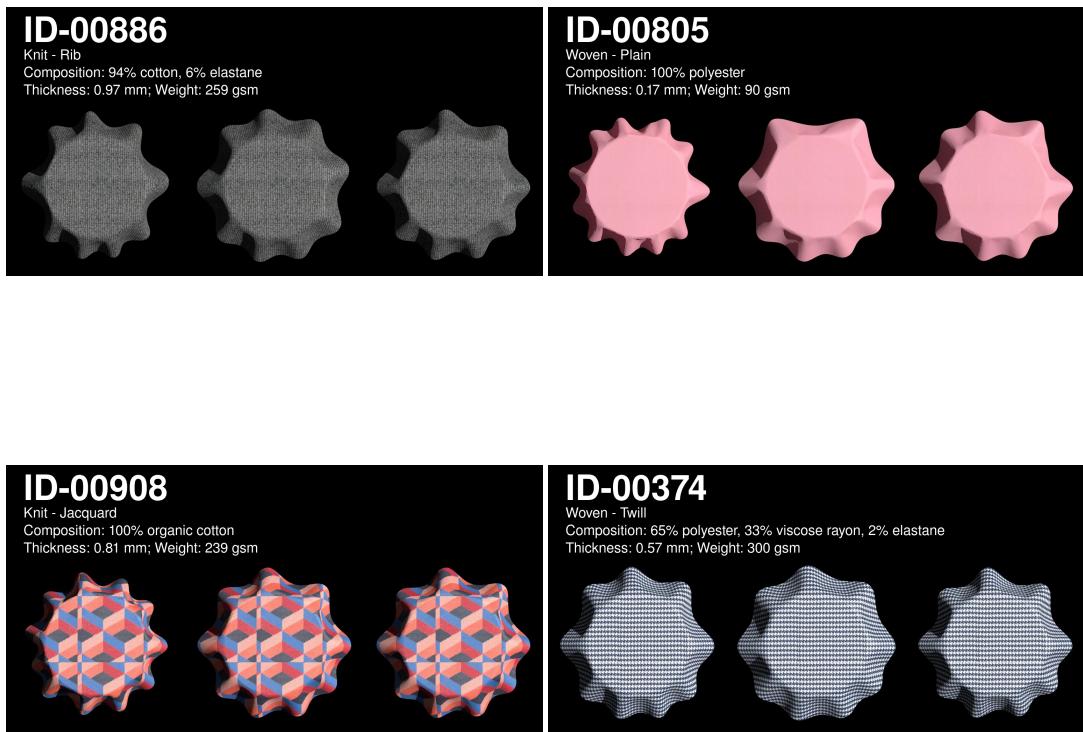












## References

- [HZRS15] HE K., ZHANG X., REN S., SUN J.: Deep residual learning for image recognition, 2015. [arXiv:1512.03385](https://arxiv.org/abs/1512.03385). 1