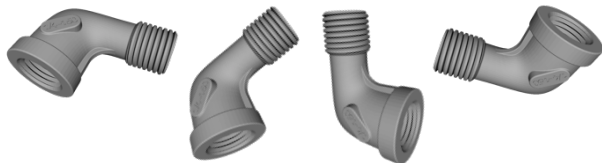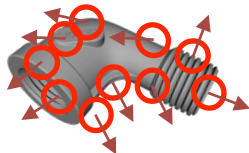# Training

Unregistered training instances
The training instances have unknown poses. No parts are predefined in the training dataset.
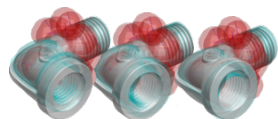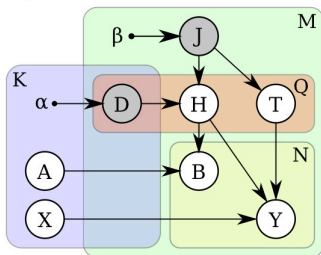
Shape feature extraction
Feature descriptors are extracted from 3D shape-based interest points

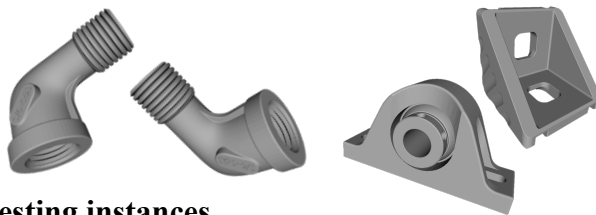**Particle-based EM algorithm**
The structure and appearances of object parts, **A** and **X**, are learned. Object poses T are inferred simultaneously.

Training instances registered to a common reference frame.

The output SAP model describes structures (**X**) and appearances (**A**) of an object class in a reference frame.
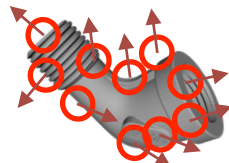
A **X**

Testing

Testing instances
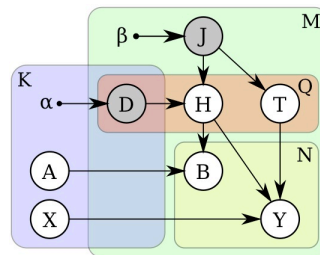The testing instances have unknown poses and class label.

Shape feature extraction
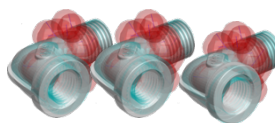Feature descriptors are extracted from 3D shape-based interest points
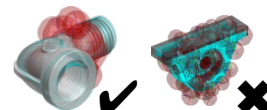
Particle-based EM algorithm
Given **X** and **A**, poses of testing instances **T** are inferred.

Appearance & Structure

Registration   **Classification**

Registration and classification are performed simultaneously using the SAP model.