Copula model selection
Image processing approach
Experiments
Concluding remarks and future work

Copula model selection using image processing

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Overview

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Copula model selection and some commonly used criteria

Copulas are widely used for the modelling of dependent risks, with extensive applications in actuarial and financial risk management.

Choosing a suitable copula family, when multivariate datasets are of small to moderate size, is a non-trivial task.
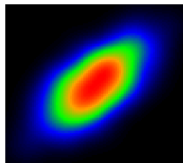
Some commonly used criteria:

- AIC,
- BIC,
- Cross-validated log-likelihood criterion,
- Cramer-von Mises statistic.

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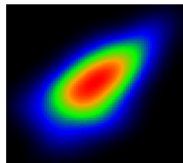Experiments
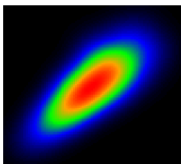Concluding remarks and future work

Image patterns for different models
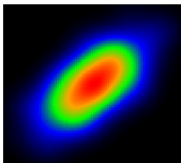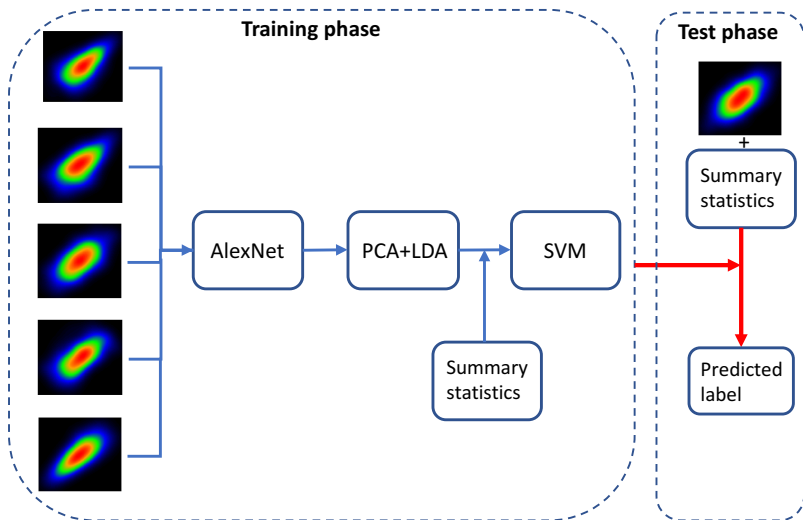

(a) Gaussian

(b) t

(c) Gumbel

(d) Clayton

(e) Joe

(f) Frank
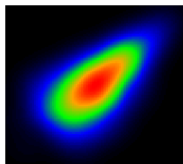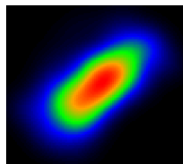
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The workflow of the image processing approach

A classification task:

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Dealing with negative correlations

Step 1 If the estimated correlation is negative, rotate the image by 90 degrees.

Step 2 If the skewness statistic is negative, rotate the image by 180 degrees.

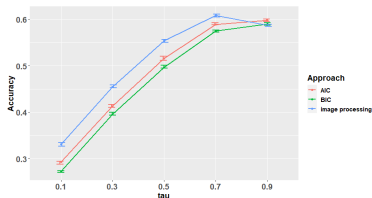The rotation steps are applied to all images before the training phase.

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Assessment criterion

If the rotation step is correct and the classification is correct, the
image is treated as correctly classified.

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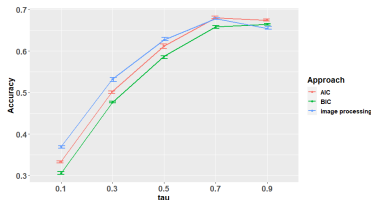Image processing approach
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Experiments

We consider 6 copula models (Gaussian, t, Gumbel, Clayton, Joe and Frank) and all their rotations.

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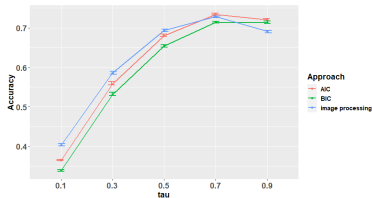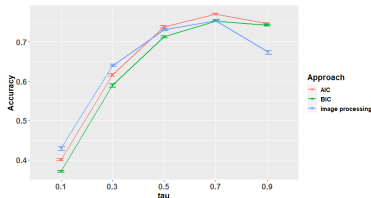Concluding remarks and future work

Experiment results: train models with fixed sample size and correlation

(a) $n = 100$

(b) $n = 150$

(c) $n = 200$

(d) $n = 250$

Copula model selection
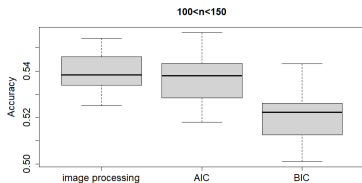Image processing approach
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Experiment results: train one model with variable sample size and correlation

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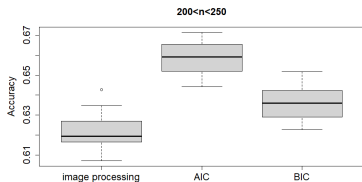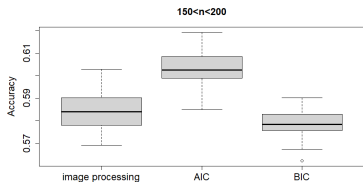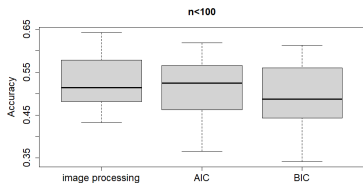
Concluding remarks and future work

- For small sample size and small correlation: the image processing approach can provide superior classification performance over AIC and BIC.
- For large sample size and large correlation: AIC dominates.
- Future work: a combination of image processing and AIC to provide good classification performance for all values of sample size and correlation.