On the authorship of BWV 534

Peter van Kranenburg
peter@musical-style-recognition.net

1 Introduction

In this study pattern recognition techniques are used to provide new insights into the authorship of musical compositions. The organ-fugue in F minor (BWV 534) has been attributed to Johann Sebastian Bach for a long time now. Recently a dispute has been started about the authenticity of this piece. David Humphreys attributes the fugue to Johann Christian Kittel, a student of Bach, but this can easily be rejected. According to Pieter Dirksen, the real composer of BWV 534 is Wilhelm Friedemann Bach, Johann Sebastian's eldest son. Besides these composers also Bach's student Johann Ludwig Krebs can be regarded as a serious candidate.

2 Modeling musical style

In the musical scores twenty features are measured in order to describe the personal style of a certain composer. These features describe low-level properties of the compositions.

> Leonard B. Meyer:
> "Style is a **replication** of **patterning**, whether in **human behavior** or in the **artifacts** produced by human behavior, that results from a series of **choices** made within some set of **constraints**."

Experimental Feature Set
- Amount of seconds
- Amount of thirds
- Amount of fourths
- Amount of augmented fourths
- Amount of diminished fifths
- Amount of fifths
- Amount of sixths
- Amount of sevenths
- Amount of octaves
- Amount of parallel thirds
- Amount of parallel fourths
- Amount of parallel sixths
- Suspension by step
- Voice density
- Amount of dissonance
- Bars starting with dissonant
- Entropy of harmonies
- Entropy of pitches
- Entropy of sonorities
- Stability of rhythm

Distributions of some features computed from 'known' works
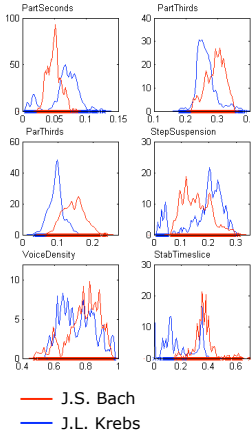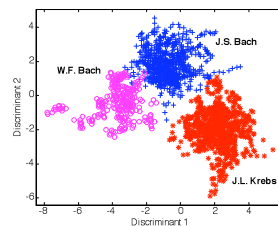

— J.S. Bach
— J.L. Krebs

3 Models for classifying BWV 534

Decision trees have been built using 'known' compositions. E.g. J.S. Bach vs. J.L. Krebs:
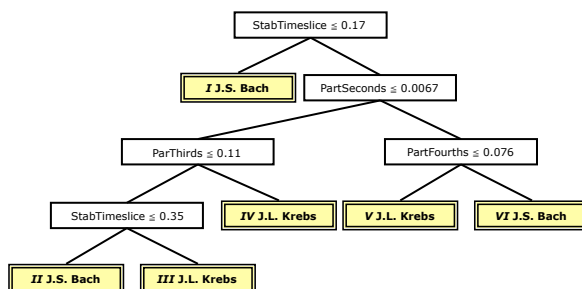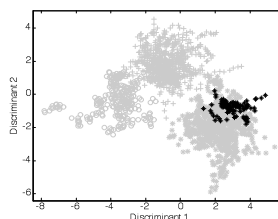

A Fisher transformation of the data in the feature space has been made.

4 Classification results

Tree J.S. Bach vs. W.F. Bach: J.S. Bach.
Tree J.S. Bach vs. J.L. Krebs: J.L. Krebs.
Tree W.F. Bach vs. J.L. Krebs: J.L. Krebs.

5 Conclusion

From the three involved composers, Johann Ludwig Krebs is most likely the composer of BWV 534. The composership of J.S. Bach and of W.F. Bach can be rejected.

J.S. Bach   W.F. Bach   J.L. Krebs