Older drivers with cognitive impairment: Perceived changes in driving skills, driving-related discomfort and self-regulation of driving

The results of a previous study indicate that in general, older drivers who recognise cognitive problems show realistic self-assessment of changes in their driving skills and that driving-related discomfort may function as an indirect monitoring of driving ability, contributing to their safe driving performance. The aim of the present study was to examine whether these findings also apply to cognitively impaired older drivers. Structured face-to-face interviews were conducted with 25 cognitively impaired older drivers. The results showed that the participants were most likely to report their driving skills as unchanged. There was an association between level of discomfort and avoidance of driving situations, but not between cognitive status and discomfort or avoidance. The results suggest that cognitively impaired older drivers constitute a unique group; while cognitively impaired older drivers may recognise cognitive problems, they tend not to recognise changes to their driving, which may reflect reluctance to acknowledge the impact of cognitive impairment on their driving. Furthermore, the results suggest that driving-related discomfort plays an important role in the self-regulation of driving among cognitively impaired older drivers. However, it is less clear what triggers driving-related discomfort among cognitively impaired older drivers indicating that it may be a less reliable aspect of their self-monitoring of driving ability.
General Purpose Multimedia Dataset - GarageBand 2008
This document describes a general purpose multimedia data-set to be used in cross-media machine learning problems. In more detail we describe the genre taxonomy applied at http://www.garageband.com, from where the data-set was collected, and how the taxonomy have been fused into a more human understandable taxonomy. Finally, a description of various features extracted from both the audio and text are presented.

General information
State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Meng, A. (Intern)
Publication date: 2008

Publication information
Place of publication: Lyngby
Publisher: Technical University of Denmark (DTU)
Original language: English
Main Research Area: Technical/natural sciences
multimedia, dataset
Source: orbit
Source-ID: 211241
Publication: Research › Report – Annual report year: 2008

Discovering Music Structure via Similarity Fusion
Automatic methods for music navigation and music recommendation exploit the structure in the music to carry out a meaningful exploration of the “song space”. To get a satisfactory performance from such systems, one should incorporate as much information about songs similarity as possible; however, how to do so is not obvious. In this paper, we build on the ideas of the Probabilistic Latent Semantic Analysis (PLSA) that have been successfully used in the document retrieval community. Under this probabilistic framework, any song will be projected into a relatively low dimensional space of “latent semantics”, in such a way that all observed similarities can be satisfactorily explained using the latent semantics. Therefore, one can think of these semantics as the real structure in music, in the sense that they can explain the observed similarities among songs. The suitability of the PLSA model for representing music structure is studied in a simplified scenario consisting of 4412 songs and two similarity measures among them. The results suggest that the PLSA model is a useful framework to combine different sources of information, and provides a reasonable space for song representation.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Cognitive Systems
Authors: Arenas-García, J. (Ekstern), Parrado-Hernandez, E. (Ekstern), Meng, A. (Intern), Larsen, J. (Intern), Hansen, L. K. (Intern)
Publication date: 2007
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 209992
Publication: Research › Poster – Annual report year: 2007

Discovering Music Structure via Similarity Fusion
Automatic methods for music navigation and music recommendation exploit the structure in the music to carry out a meaningful exploration of the “song space”. To get a satisfactory performance from such systems, one should incorporate as much information about songs similarity as possible; however, how to do so is not obvious. In this paper, we build on the ideas of the Probabilistic Latent Semantic Analysis (PLSA) that have been successfully used in the document retrieval community. Under this probabilistic framework, any song will be projected into a relatively low dimensional space of “latent semantics”, in such a way that all observed similarities can be satisfactorily explained using the latent semantics. Therefore, one can think of these semantics as the real structure in music, in the sense that they can explain the observed similarities among songs. The suitability of the PLSA model for representing music structure is studied in a simplified scenario consisting of 4412 songs and two similarity measures among them. The results suggest that the PLSA model is a useful framework to combine different sources of information, and provides a reasonable space for song representation.
Temporal feature integration for music genre classification

Temporal feature integration is the process of combining all the feature vectors in a time window into a single feature vector in order to capture the relevant temporal information in the window. The mean and variance along the temporal dimension are often used for temporal feature integration, but they capture neither the temporal dynamics nor dependencies among the individual feature dimensions. Here, a multivariate autoregressive feature model is proposed to solve this problem for music genre classification. This model gives two different feature sets, the diagonal autoregressive (DAR) and multivariate autoregressive (MAR) features which are compared against the baseline mean-variance as well as two other temporal feature integration techniques. Reproducibility in performance ranking of temporal feature integration methods were demonstrated using two data sets with five and eleven music genres, and by using four different classification schemes. The methods were further compared to human performance. The proposed MAR features perform better than the other features at the cost of increased computational complexity.
Nowadays there is an increasing interest in developing methods for building music recommendation systems. In order to get a satisfactory performance from such a system, one needs to incorporate as much information about songs similarity as possible; however, how to do so is not obvious. In this paper, we build on the ideas of the Probabilistic Latent Semantic Analysis (PLSA) that has been successfully used in the document retrieval community. Under this probabilistic framework, any song will be projected into a relatively low dimensional space of "latent semantics", in such a way that all observed similarities can be satisfactorily explained using the latent semantics. Additionally, this approach significantly simplifies the song retrieval phase, leading to a more practical system implementation. The suitability of the PLSA model for representing music structure is studied in a simplified scenario consisting of 10,000 songs and two similarity measures among them. The results suggest that the PLSA model is a useful framework to combine different sources of information, and provides a reasonable space for song representation.
Temporal Feature Integration for Music Organisation

This Ph.D. thesis focuses on temporal feature integration for music organisation. Temporal feature integration is the process of combining all the feature vectors of a given time-frame into a single new feature vector in order to capture relevant information in the frame. Several existing methods for handling sequences of features are formulated in the temporal feature integration framework. Two datasets for music genre classification have been considered as valid test-beds for music organisation. Human evaluations of these, have been obtained to access the subjectivity on the datasets. Temporal feature integration has been used for ranking various short-time features at different time-scales. This include short-time features such as the Mel frequency cepstral coefficients (MFCC), linear predicting coding coefficients (LPC) and various MPEG-7 short-time features. The ‘consensus sensitivity ranking’ approach is proposed for ranking the short-time features at larger time-scales according to their discriminative power in a music genre classification task. The multivariate AR (MAR) model has been proposed for temporal feature integration. It effectively models local dynamical structure of the short-time features. Different kernel functions such as the convolutive kernel, the product probability kernel and the symmetric Kullback Leibler divergence kernel, which measures similarity between frames of music have been investigated for aiding temporal feature integration in music organisation. A special emphasis is put on the product probability kernel for which the MAR model is derived in closed form. A thorough investigation, using robust machine learning methods, of the MAR model on two different music genre classification datasets, shows a statistical significant improvement using this model in comparison to existing temporal feature integration models. This improvement was more pronounced for the larger and more difficult dataset. Similar findings where observed using the MAR model in a product probability kernel. The MAR model clearly outperformed the other investigated density models: the multivariate Gaussian model and the Gaussian mixture model.

General information

State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Meng, A. (Intern), Larsen, J. (Intern), Hansen, L. K. (Intern)
Publication date: Jun 2006

Publication information

Original language: English
Series: IMM-PHD-2006-165
Main Research Area: Technical/natural sciences
Electronic versions:
imm4502.pdf
Source: orbit
Source-ID: 191707
Publication: Research › Ph.D. thesis – Annual report year: 2006

Optimal filtering of dynamics in short-time features for music organization

General information

State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Arenas-García, J. (Ekstern), Larsen, J. (Intern), Hansen, L. K. (Intern), Meng, A. (Intern)
Publication date: 2006

Host publication Information

Title of host publication: 7th International Conference on Music Information Retrieval (ISMIR 2006)
Main Research Area: Technical/natural sciences
Electronic versions:
imm4522.pdf
Links:
http://www2.imm.dtu.dk/pubdb/p.php?4522
Source: orbit
Source-ID: 191519
Publication: Research - peer-review › Article in proceedings – Annual report year: 2006

An Investigation of Feature Models for Music Genre Classification using the Support Vector Classifier

In music genre classification the decision time is typically of the order of several seconds however most automatic music genre classification systems focus on short time features derived from 10-50ms. This work investigates two models, the multivariate gaussian model and the multivariate autoregressive model for modelling short time features. Furthermore, it was investigated how these models can be integrated over a segment of short time features into a kernel such that a support vector machine can be applied. Two kernels with this property were considered, the convolution kernel and
product probability kernel. In order to examine the different methods an 11 genre music setup was utilized. In this setup the Mel Frequency Cepstral Coefficients (MFCC) were used as short time features. The accuracy of the best performing model on this data set was 44% as compared to a human performance of 52% on the same data set.

**General information**
State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Meng, A. (Intern), Shawe-Taylor, J. (Ekstern)
Pages: 604-609
Publication date: 2005

**Host publication Information**
Title of host publication: International Conference on Music Information Retrieval
Main Research Area: Technical/natural sciences
Support Vector Machine, Product Probability Kernel, Convolution Kernel, Music Genre, Feature Integration

Electronic versions:
imm3660.pdf
Source: orbit
Source-ID: 185718
Publication: Research - peer-review › Article in proceedings – Annual report year: 2005

**Clever Toolbox - the Art of Automated Genre Classification**
Automatic musical genre classification can be defined as the science of finding computer algorithms that a digitized sound clip as input and yield a musical genre as output. The goal of automated genre classification is, of course, that the musical genre should agree with the human classification. This demo illustrates an approach to the problem that first extract frequency-based sound features followed by a "linear regression" classifier. The basic features are the so-called mel-frequency cepstral coefficients (MFCCs), which are extracted on a time-scale of 30 msec. From these MFCC features, auto-regressive coefficients (ARs) are extracted along with the mean and gain to get a single (30 dimensional) feature vector on the time-scale of 1 second. These features have been used because they have performed well in a previous study (Meng, Ahrendt, Larsen (2005)). Linear regression (or single-layer linear NN) is subsequently used for classification. This classifier is rather simple; current research investigates more advanced methods of classification.

**General information**
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Cognitive Systems
Authors: Ahrendt, P. (Intern), Meng, A. (Intern), Larsen, J. (Intern), Lehmann, S. (Ekstern)
Publication date: 2005

**Publication information**
Original language: English
Place of publication: Kgs. Lyngby
Publisher: Informatics and Mathematical Modelling, Technical University of Denmark
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 202500
Publication: Research › Interactive production – Annual report year: 2005

**Improving Music Genre Classification by Short Time Feature Integration**
Many different short-time features (derived from 10-30ms of audio) have been proposed for music segmentation, retrieval and genre classification. Often the available time frame of the music to make a decision (the decision time horizon) is in the range of seconds instead of milliseconds. The problem of making new features on the larger time scale from the short-time features (feature integration) has only received little attention. This paper investigates different methods for feature integration (early information fusion) and late information fusion (assembling of probabilistic outputs or decisions from the classifier, e.g. majority voting) for music genre classification.

**General information**
State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Meng, A. (Intern), Ahrendt, P. (Intern), Larsen, J. (Intern)
Publication date: 2005
Main Research Area: Technical/natural sciences
Improving Music Genre Classification by Short-Time Feature Integration

Many different short-time features, using time windows in the size of 10-30 ms, have been proposed for music segmentation, retrieval and genre classification. However, often the available time frame of the music to make the actual decision or comparison (the decision time horizon) is in the range of seconds instead of milliseconds. The problem of making new features on the larger time scale from the short-time features (feature integration) has only received little attention. This paper investigates different methods for feature integration and late information fusion for music genre classification. A new feature integration technique, the AR model, is proposed and seemingly outperforms the commonly used mean-variance features.
Audio Mining with emphasis on Music Genre Classification

Audio is an important part of our daily life, basically it increases our impression of the world around us whether this is communication, music, danger detection etc. Currently the field of Audio Mining, which here includes areas of music genre, music recognition / retrieval, playlist generation etc. is receiving quite a lot of attention. The first breakthrough in audio mining was created by MuscleFish in 1996, a simple audio retrieval system. With the increasing amount of audio material being accessible through the web, e.g. Apple’s iTunes (700,000+ songs), Sony, Amazon, new methods in searching / retrieving audio effectively is needed. Currently, search engines such as e.g. Google, AltaVista etc. do not search into audio files, but uses either the textual information attached to the audio file or the textual information around the audio. Also in the hearing aid industries around the world the problem of detecting environments from the input audio is researched as to increase the life quality of hearing-impaired. Basically there is a lot of work within the field of audio mining. The presentation will mainly focus on music genre classification where we have a fixed amount of genres to choose from. Basically every audio mining system is more or less consisting of the same stages as for the music genre setting. My research so far has mainly focussed on finding relevant features for music genre classification living at different timescales using early and late information fusion. It has been found that for the task of music genre classification, the features, and their temporal relationships are very important when determining the music genre.

General information
State: Published
Organisations: Cognitive Systems, Department of Informatics and Mathematical Modeling
Authors: Meng, A. (Intern)
Publication date: 2004
Event:
Main Research Area: Technical/natural sciences
Classification, Audio Mining, Feature extraction, Early / Late information fusion
Electronic versions:
imm3354.pdf
imm3354.zip

Bibliographical note
A presentation as to introduce some of my work at IMM to the ISIS group in Southampton.
Source: orbit
Source-ID: 201217
Publication: Research › Poster – Annual report year: 2004

Decision time horizon for music genre classification using short time features

In this paper music genre classification has been explored with special emphasis on the decision time horizon and ranking of tapped-delay-line short-time features. Late information fusion as e.g. majority voting is compared with techniques of early information fusion such as dynamic PCA (DPCA). The most frequently suggested features in the literature were employed including mel-frequency cepstral coefficients (MFCC), linear prediction coefficients (LPC), zero-crossing rate (ZCR), and MPEG-7 features. To rank the importance of the short time features consensus sensitivity analysis is applied. A Gaussian classifier (GC) with full covariance structure and a linear neural network (NN) classifier are used.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Cognitive Systems
Authors: Ahrendt, P. (Intern), Meng, A. (Intern), Larsen, J. (Intern)
Pages: 1293-1296
Publication date: 2004

Host publication information
Title of host publication: EUSIPCO
Main Research Area: Technical/natural sciences
Electronic versions:
imm2981.pdf
Links:
Source: orbit
Source-ID: 154589
Publication: Research - peer-review › Article in proceedings – Annual report year: 2004

Projects:
Webmining: Finding Meaning in Distributed Signals on the Internet

Department of Informatics and Mathematical Modeling
Period: 01/04/2003 → 30/06/2006
Number of participants: 7
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Meng, Anders (Intern)
Supervisor:
Hansen, Lars Kai (Intern)
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Larsen, Jan (Intern)
Examiner:
Winther, Ole (Intern)
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Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD