

SortMyTunes

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Predispositions

- Collections of music are growing larger and larger
- Music is, at this time, too complicated for computers to truly "understand"
- Right now, the human brain is still the best way for us to understand what constitutes a piece of music
- Computers are very useful for automation-related tasks, such as sorting and searching

Predispositions

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Research: Current Music Databases

- Amazon.com has over 1.75 million CDs and 2.5 million MP3s in its music collection
- Pandora indexes over 600,000 tracks
 - Over 400 features per track
 - 20-30 minutes per track to manually input the correct metadata
- MusicBrainz contains 6,166,820 tracks
 - 340,162 distinct artists
 - 523,499 distinct albums
- The Listen Game provides metadata for over 900,000 tracks

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Research: MIREX 2007

- The databases used for MIREX 2007 artist and genre classification contained “just” 10,000 tracks and “just” 10 genres
- Each track had to be manually annotated to determine ground truth
- Best genre classification algorithm: 69% accuracy
- Best artist classification algorithm: 48% accuracy

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Insights

- All existing large systems use some kind of metadata-based manual classification system
- Existing music classification systems cannot keep up with the increasing scale of music collections
- Human-based systems such as the Listen game have been very successful (“games with a purpose”)
- MIREX algorithms need to be more accurate for them to be immediately applicable today

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Concept: SortMyTunes

- "Hybrid" music classification system
- Combines the musical intelligence of a human being with the automation skills of a computer

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Concept: SortMyTunes

- User classifies some tracks into groups of his or her choosing
- SortMyTunes compares the features of these classified tracks to the tracks in the database
- SortMyTunes then sorts the tracks in the database according to the groups the user specified using the k-means algorithm

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SortMyTunes: User Tasks

- Create clusters of tracks (“pods”)
- Select a few tracks that best represent what the user wants the “pods” to resemble

Predispositions

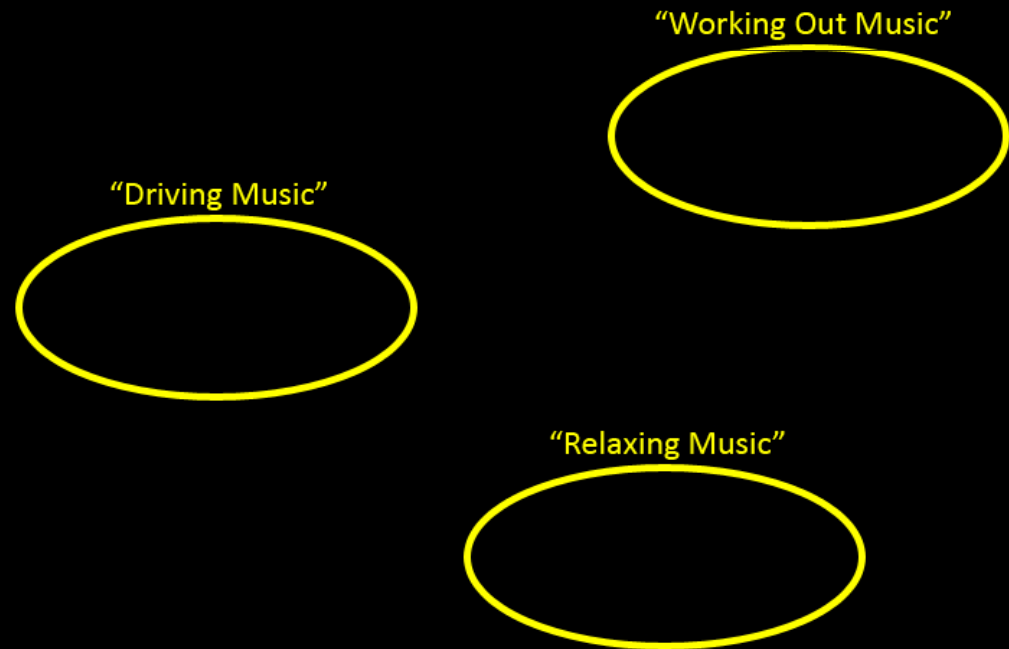
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SortMyTunes: User Tasks

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Predispositions

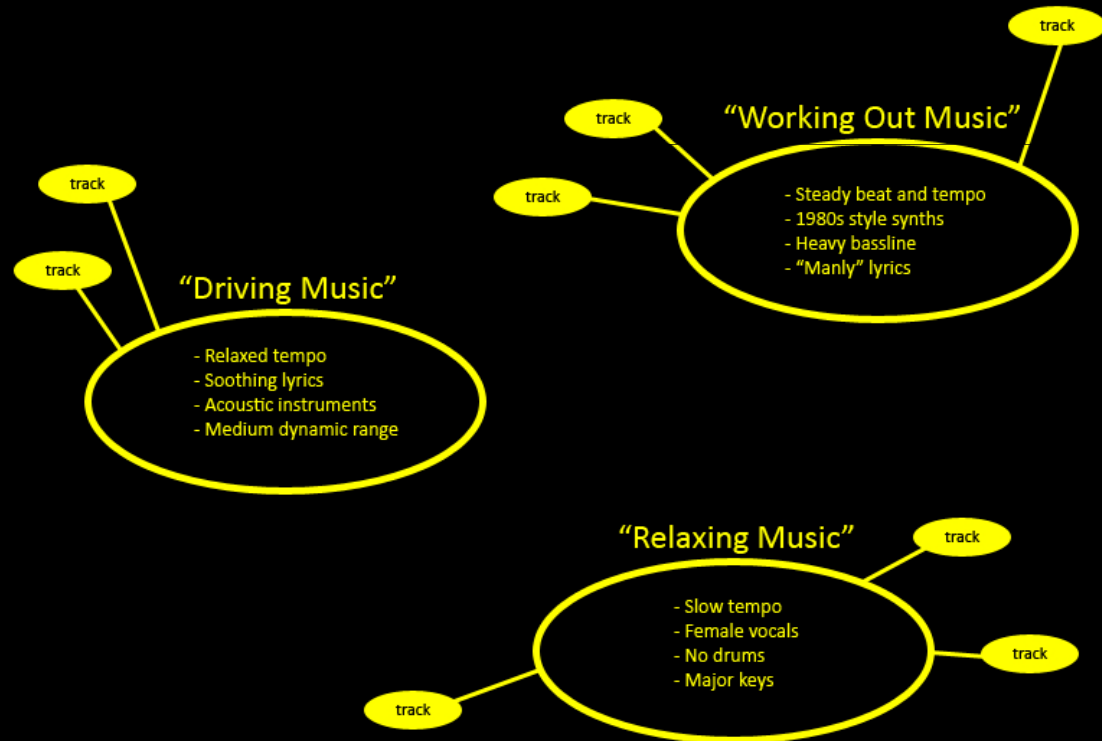
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SortMyTunes: User Tasks

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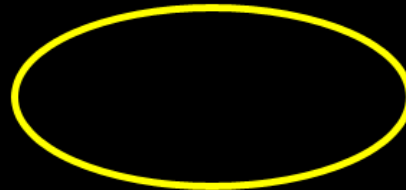
Insights

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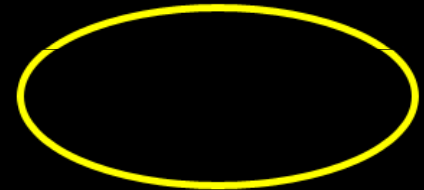
Prototype

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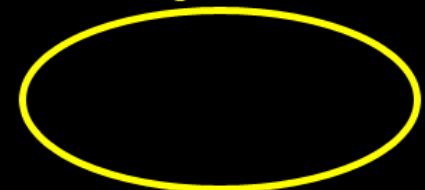
"Chart Risers"



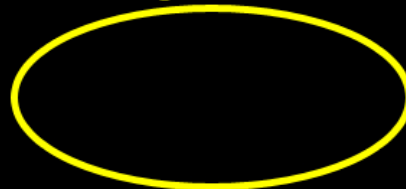
"Chart Flops"



"Big Losers"



"Big Gainers"



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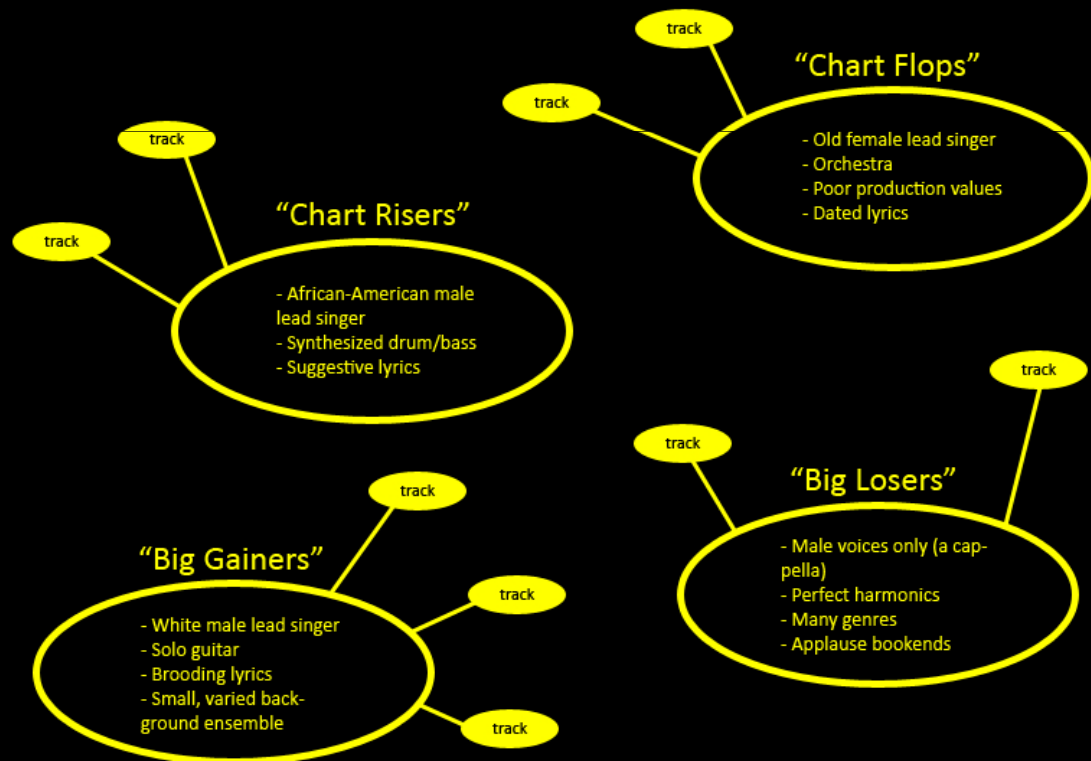
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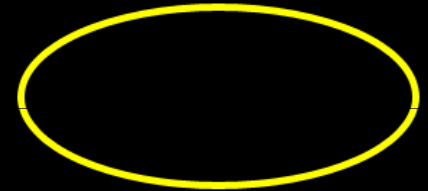
SortMyTunes: User Tasks

- Create clusters of tracks ("pods")
- Select a few tracks that best represent what the user wants the "pods" to resemble

"Disco"



"Rap"



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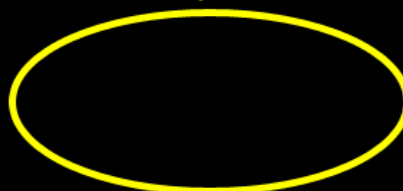
"Big Band"



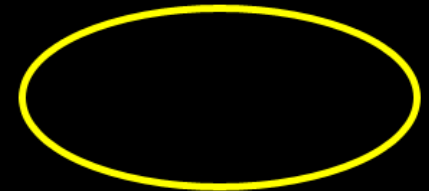
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"Heavy Metal"

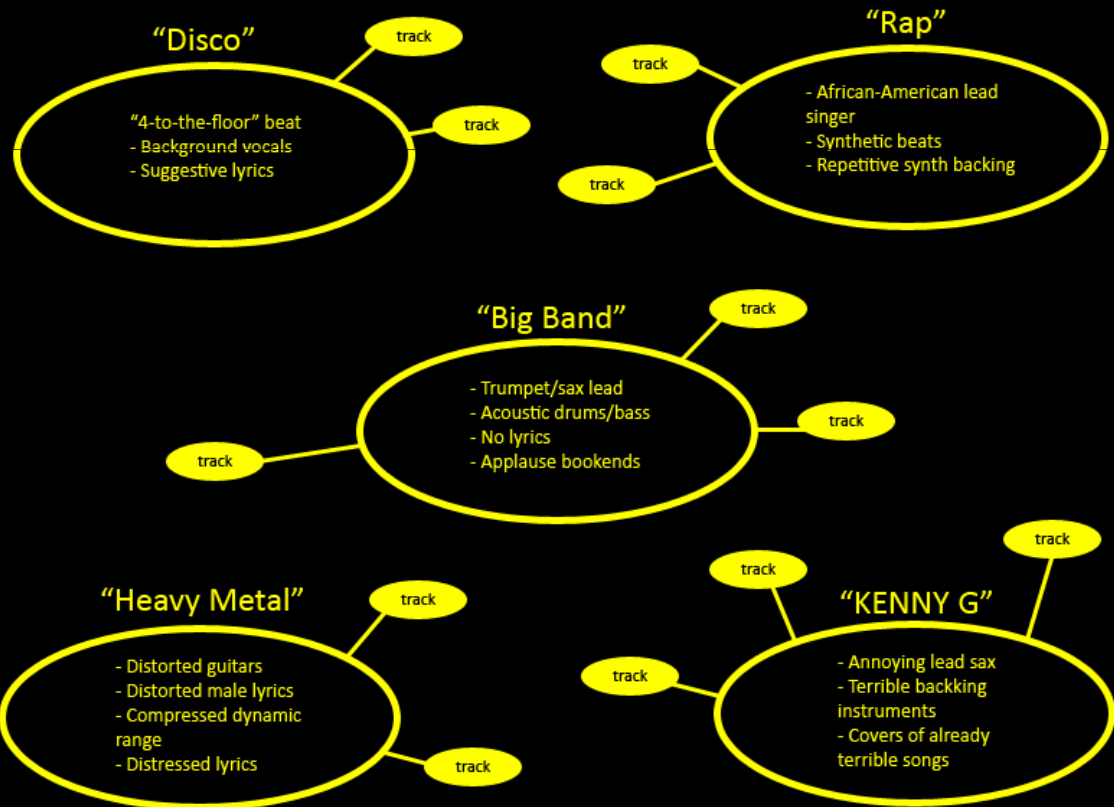


"KENNY G"



SortMyTunes: User Tasks

- Create clusters of tracks (“pods”)
- Select a few tracks that best represent what the user wants the “pods” to resemble



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SortMyTunes: Computer Tasks

- Iterate over a portion of the collection
- Classify this portion into the pods the user created

```
/* Pseudocode: */
```

```
database.determineEachPod(); // determine characteristics of each pod  
int tracknum=0;
```

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```
while(!iteration.isEmpty()) // for each track in the given iteration  
{
```

```
    Pod mostSimilarPod = tracks[tracknum].classifyWithKMeans();
```

```
    // For each track, classify it into a pod
```

```
    tracknum++; // move on to the next track
```

```
}
```

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SortMyTunes: K-Means Classification

```
Pod mostSimilarPod = tracks[tracknum].classifyWithKMeans();  
    // For each track, classify it into a pod
```

- Mean feature values of each pod are extracted
- Each new track's feature values are compared to this mean value, assigned a difference vector for each feature
- Each track gets classified into the pod with the lowest cumulative difference vector
- Since number of clusters are known, K-means is efficient and relatively robust to noise

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SortMyTunes: More User Tasks

- Re-classify any tracks that the computer "messed up"
- Add or remove any pods

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SortMyTunes: More Computer Tasks

- Iterate over another portion of the collection, as before
- Each iteration gets larger, as k-means accuracy increases with each iteration

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- Rinse, repeat!

SortMyTunes: Prototype

- SortMyTunes is written entirely in Java 6
 - 1,800 lines of code (framework only)
- Metadata harvested from sources such as Musicbrainz or Last.FM
- SortMyTunes is a **framework** for classification, not the classification itself
- Feature recognition is designed on a "plug-and-play" basis
 - Interfaces
 - Abstract classes, methods for feature classifying
- Current performance: $O(Kn^2)$ --> $O(n^2)$

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SortMyTunes: The Future

- Target uses include:
 - Personal collections
 - Commercial databases
 - Efficient MIREX ground truth creation
- Export to other platforms
- Connect to an internet database
- Encourage third parties to develop more/better feature classification algorithms
- Streamline the feature classification interface; create a true “plug-and-play” system

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SortMyTunes: The Future

- Performance is currently not that great
- Features are extracted via metadata, not the music itself
- Current feature classifiers are not very robust or accurate (placeholders)
- Would like eventually to use real music data
- Implement functionality for “incomplete” data

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Questions/Contact:

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