A Personality-based Adaptive System for Visualizing Classical Music Performances

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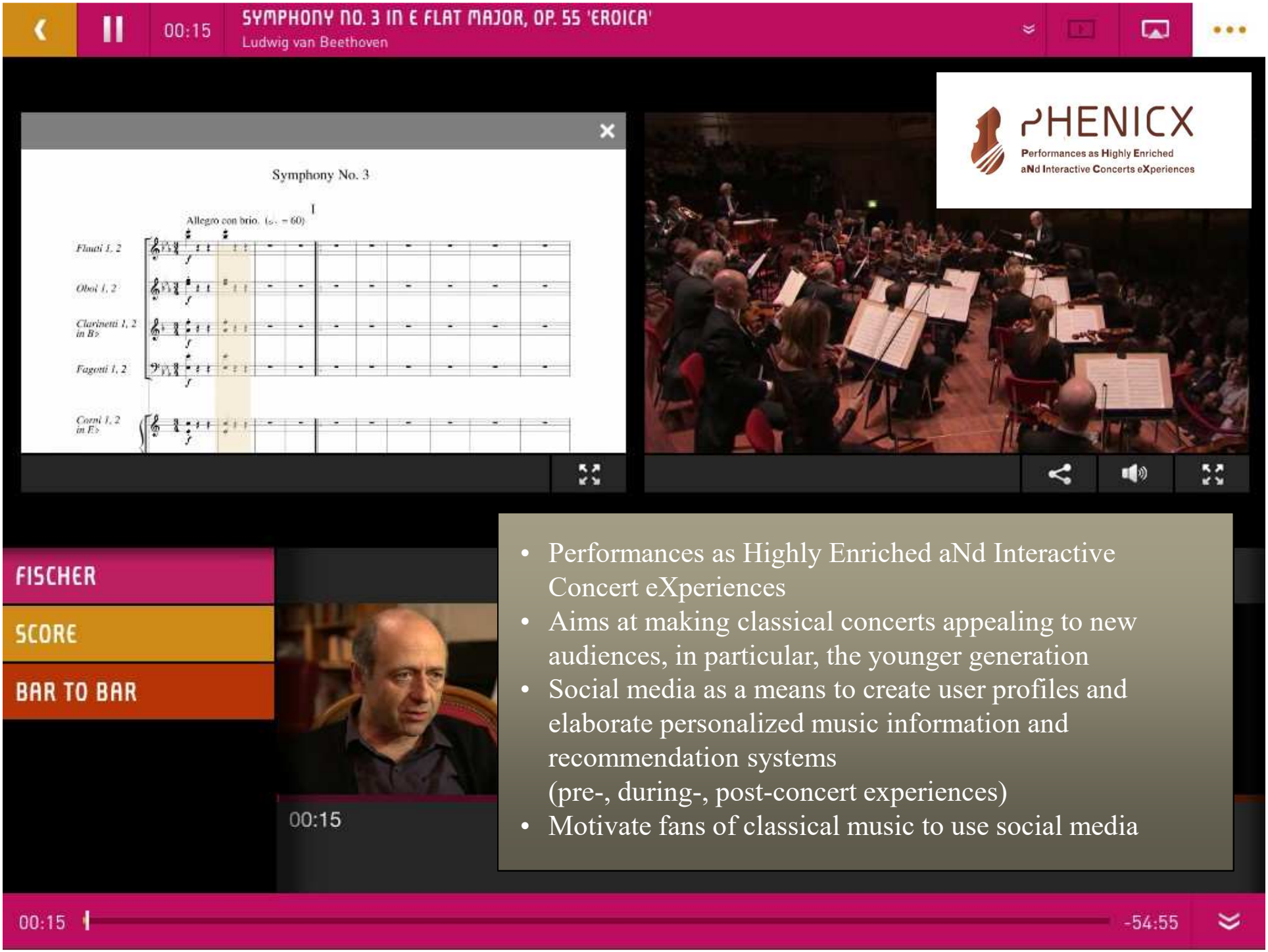


- Performances as Highly Enriched aNd Interactive Concert eXperiences
- Aims at making classical concerts appealing to new audiences, in particular, the younger generation
- Social media as a means to create user profiles and elaborate personalized music information and recommendation systems
  (pre-, during-, post-concert experiences)
- Motivate fans of classical music to use social media

Aim

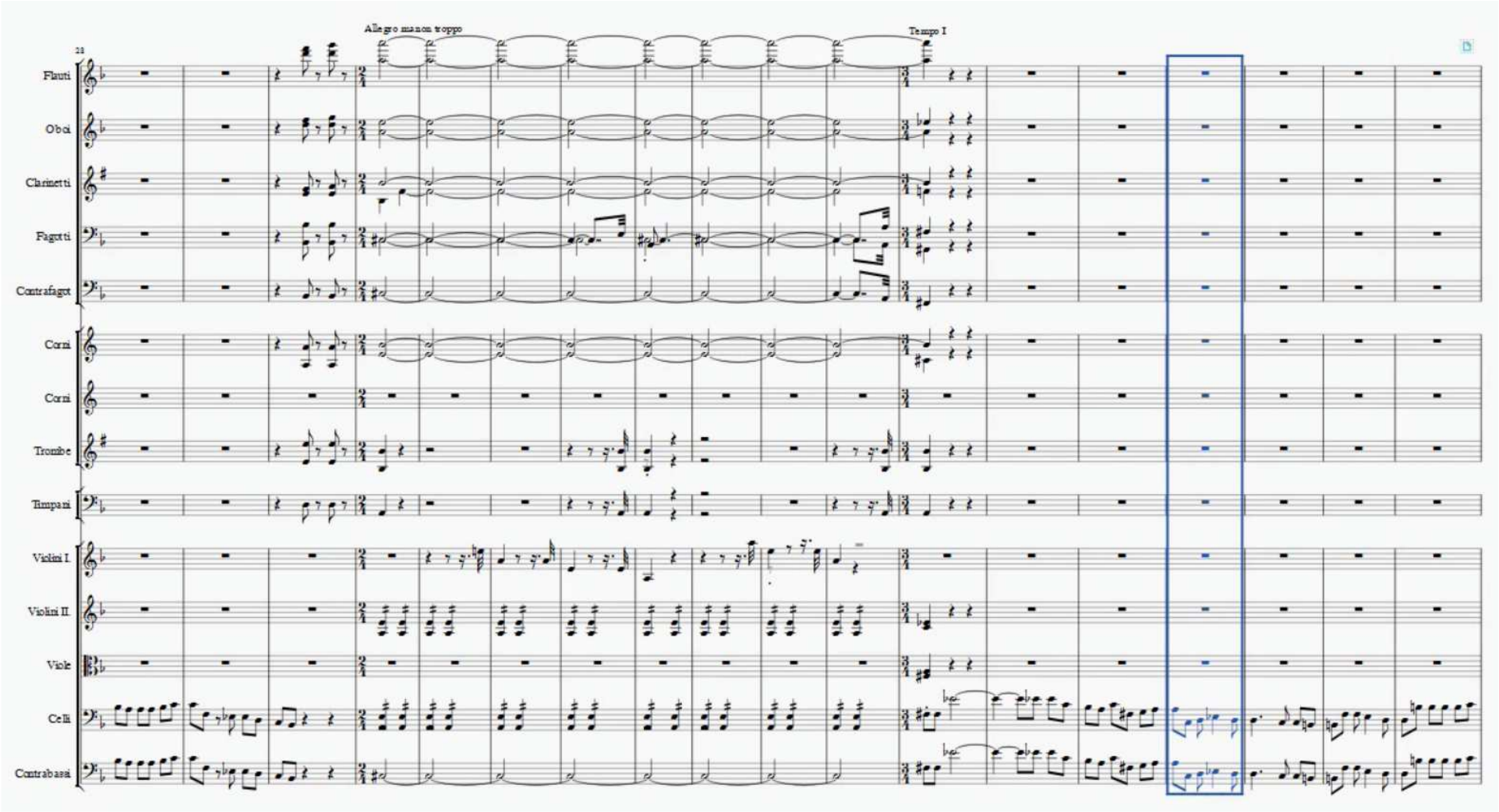
To create a **personalized** music information system, in this case a **music visualization system**.

For personalization, we model listeners in terms of **personality traits**, according to the Big Five Inventory (BFI): Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism

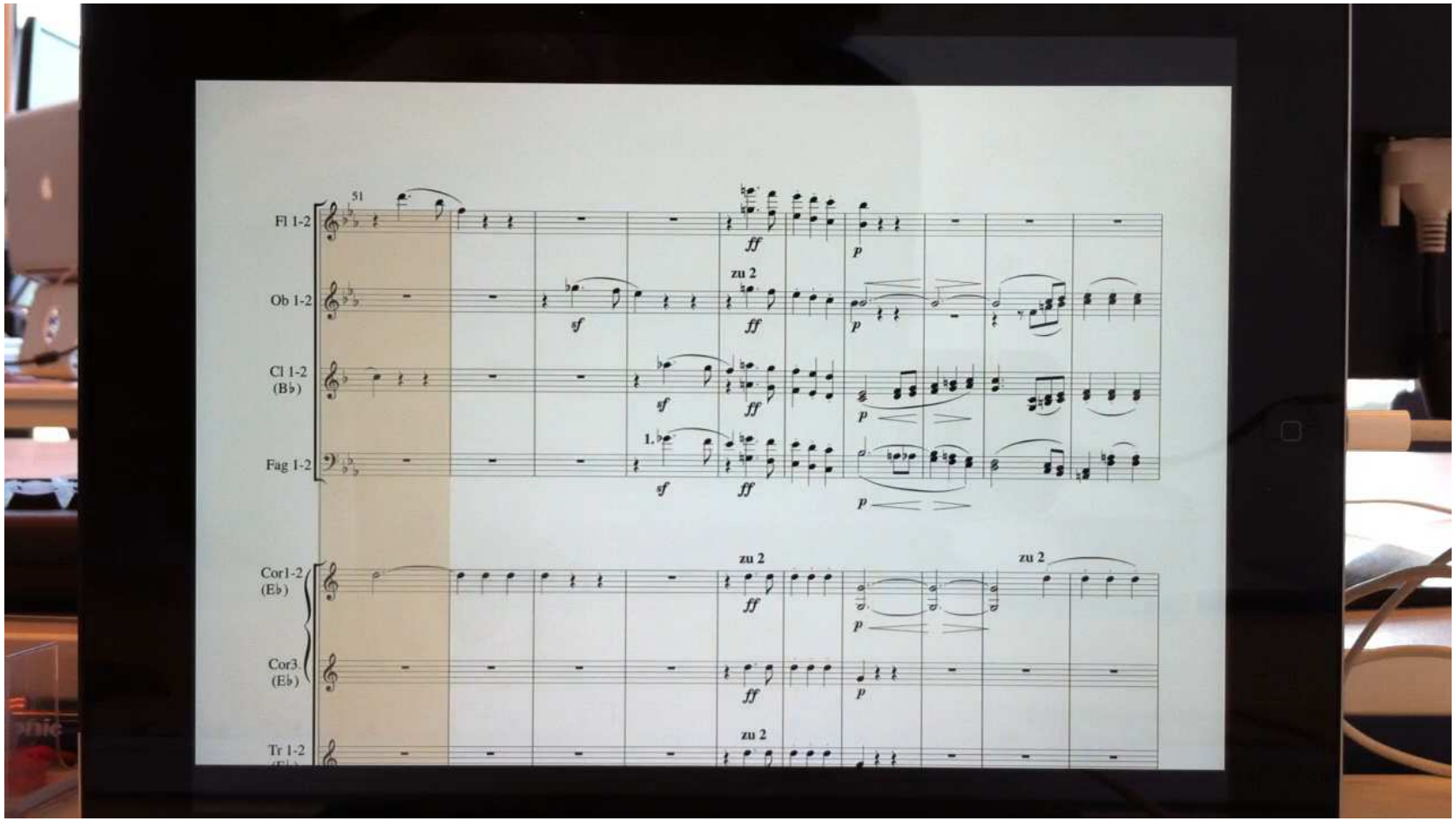
Overview

- Visualizations for classical music in PHENICX
- Investigating personality-based preferences for visualizations
- Personalized music visualization system
- Evaluation and conclusions

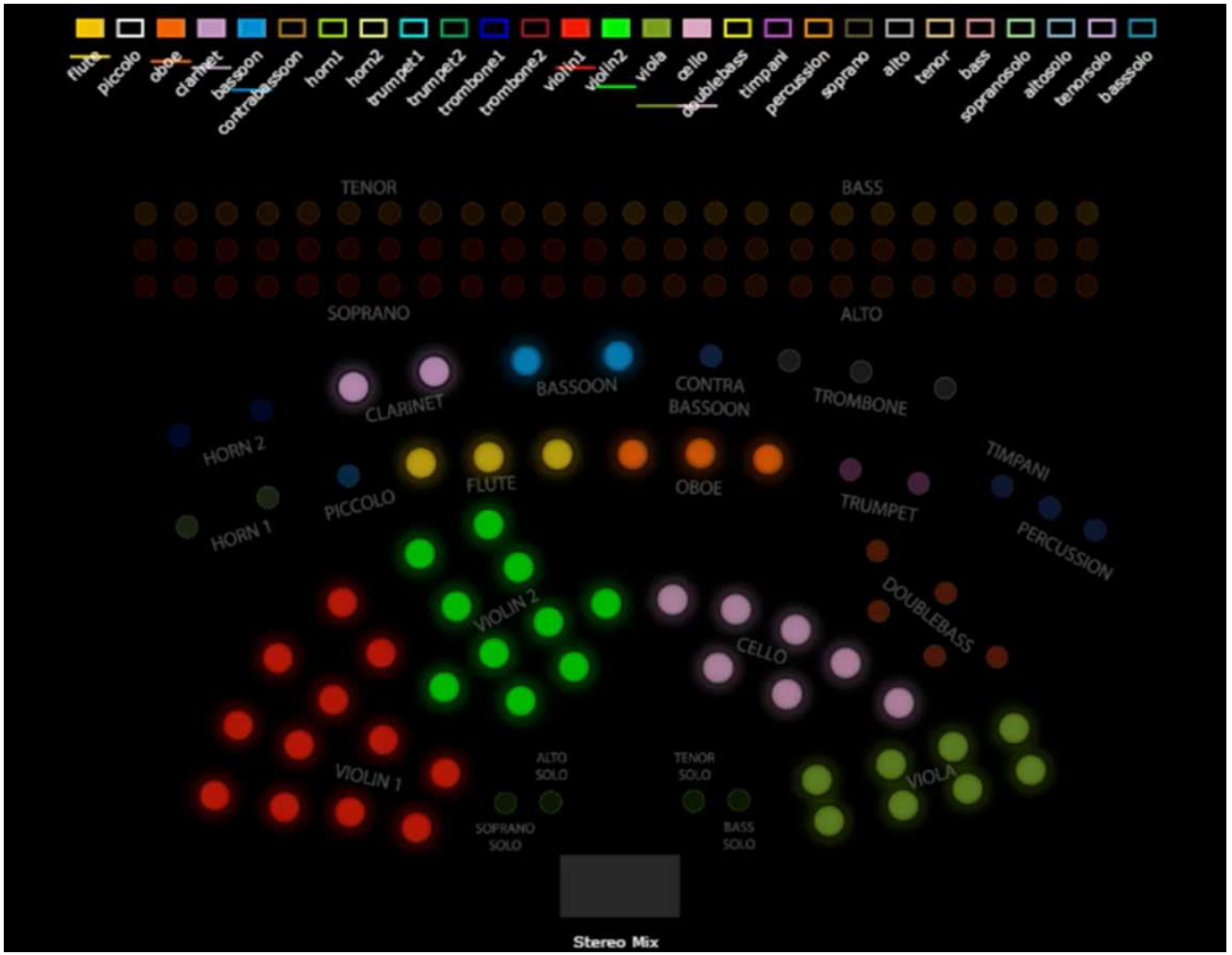
Visualizations for classical music
Score Follower



Visualizations for classical music
Score Follower



Visualizations for classical music
Orchestra Layout



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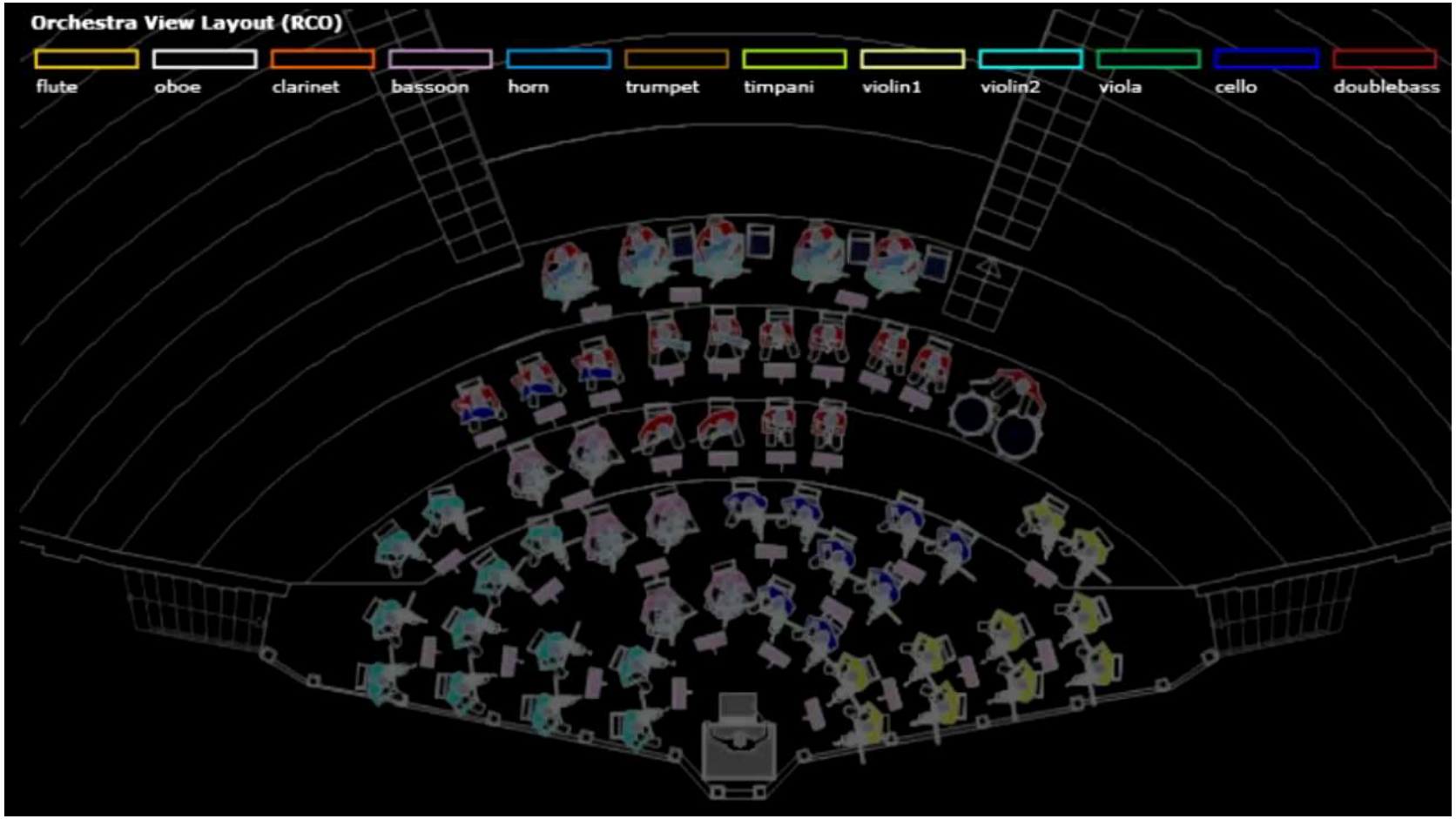
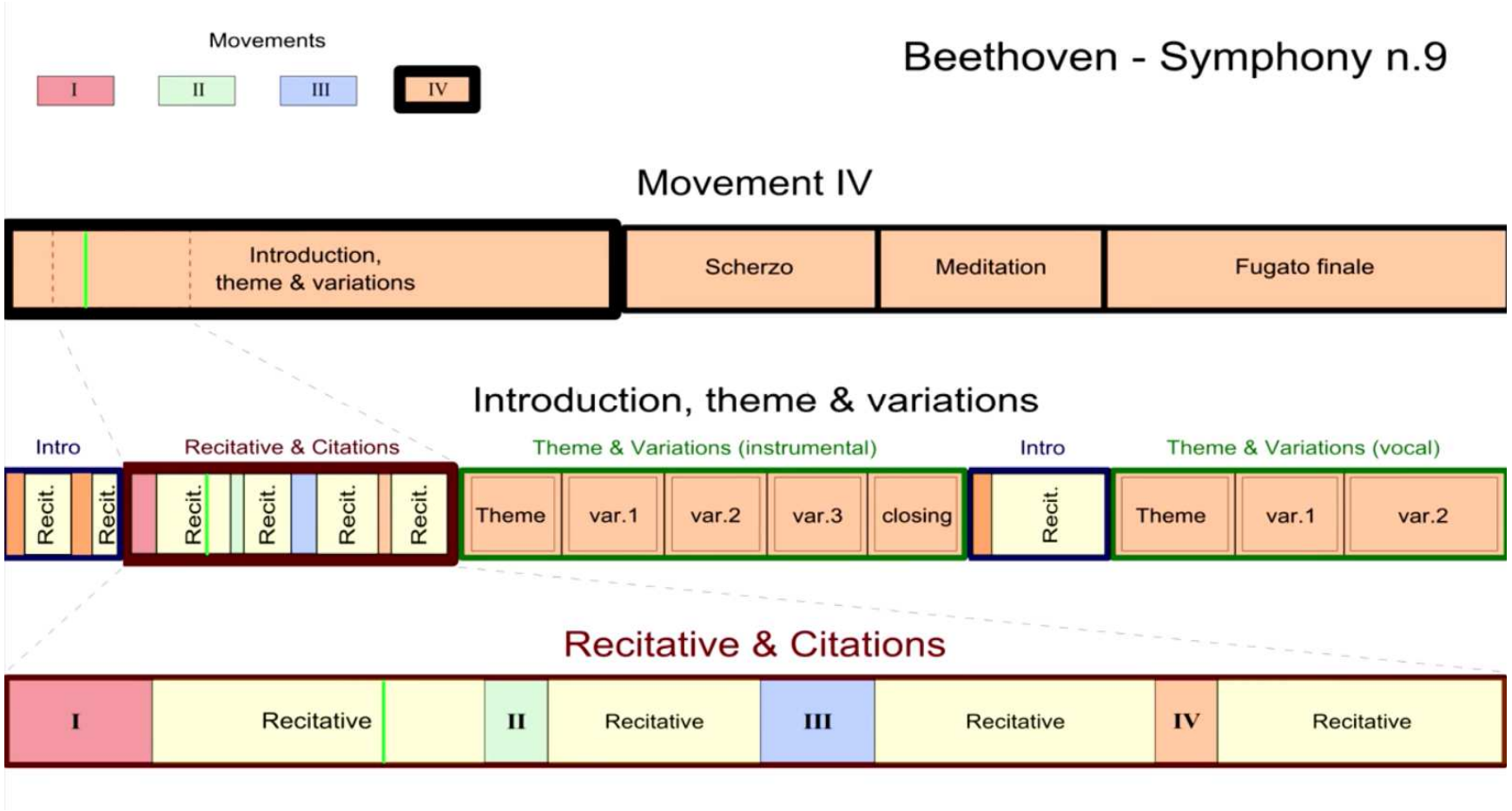
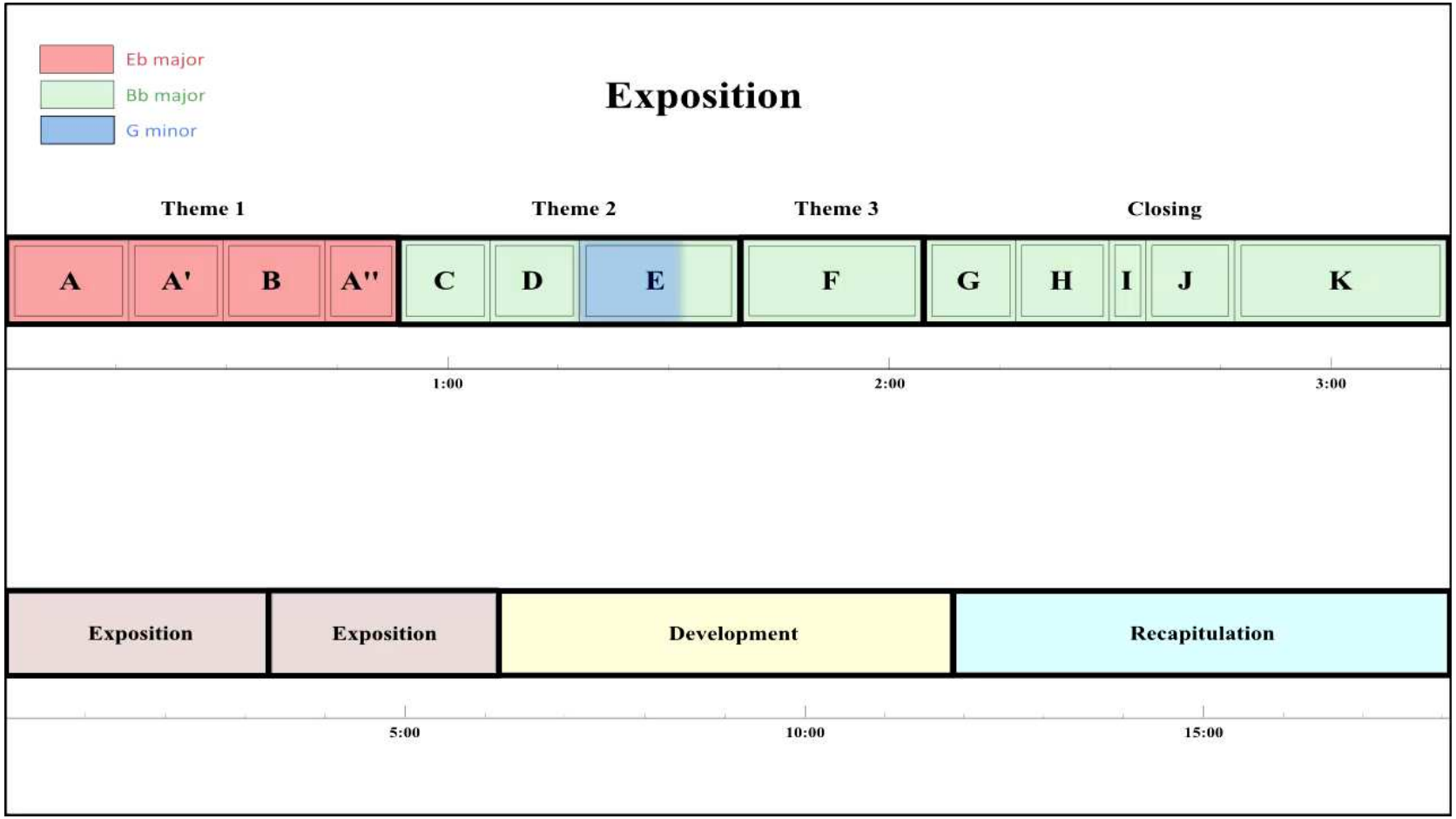


Visualizations for classical music
Structure Visualization



Visualizations for classical music
Structure Visualization



Investigating personality-based preferences for visualizations

User study to investigate relationship between **personality traits** and **preference for visualization**

Experimental setup:

- Personality traits assessed by *44-items BFI questionnaire*
- Preference assessed by *pragmatic quality* (technical, complicated, impractical, cumbersome, unpredictable, confusing, unruly)
- Study conducted via Amazon Mechanical Turk
- 185 participants, paid 1.50$, task lasted 17 minutes on average
- Between-subject design
- Participants first filled in the BFI-44 questionnaire, then were shown a demo video of the assigned visualization (Beethoven's 9th symphony), and asked to answer the pragmatic quality questions on a 7-point scale

Investigating personality-based preferences for visualizations

Correlation analysis between personality traits and pragmatic quality ratings revealed several moderate, significant correlations ($p < 0.03$):

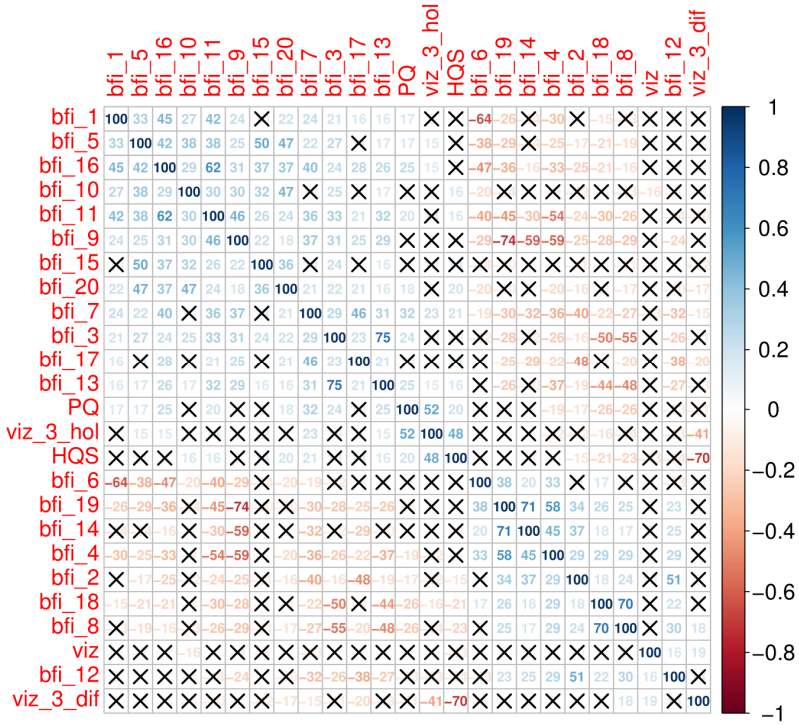
Visualization	Personality Trait	Rating Question	Correlation	p-value
Score Follower	Conscientiousness	cumbersome-direct	0.30	0.02184
Score Follower	Extraversion	pragmatic quality (overall)	0.36	0.00633
Score Follower	Agreeableness	lame-exciting	0.31	0.01727
Score Follower	Agreeableness	pragmatic quality (overall)	0.32	0.01637
Structure Visualization	Extraversion	technical-human	0.30	0.01540
Structure Visualization	Agreeableness	technical-human	0.33	0.00729
Structure Visualization	Agreeableness	impractical-practical	0.45	0.00019
Structure Visualization	Agreeableness	cumbersome-direct	0.38	0.00207
Structure Visualization	Agreeableness	confusing-clear	0.42	0.00052
Structure Visualization	Agreeableness	unruly-manageable	0.42	0.00065

Personalized music visualization system

- Real system that was implemented into the “RCO Editions” mobile application for enhanced experience of concerts
- Users won’t answer 44 BFI questions before using the system
- Cross-correlations between BFI-44 and PQ scores to select two questions with highest absolute correlation:

BFI-7: “I see myself as someone who is helpful and unselfish with others.”

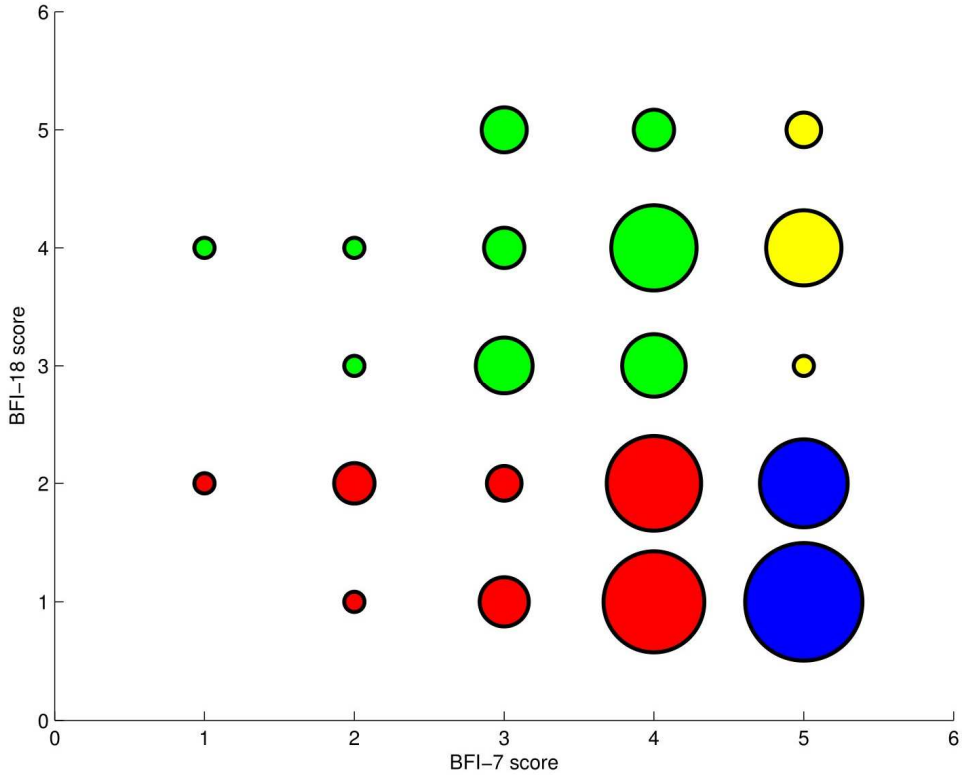
BFI-18: “I see myself as someone who tends to be disorganized.”



Personalized music visualization system

Recommending visualization:

- Cluster users with respect to their answers to BFI-7 and -18
- Split at median value into lo-lo, lo-hi, hi-lo, and hi-hi groups



Personalized music visualization system

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- Split at median value into lo-lo, lo-hi, hi-lo, and hi-hi groups
- Each cluster has its own preferred visualization

Personality Cluster	1st Rank	2nd Rank	3rd Rank
lo-lo	Orchestra Layout	Structure Visualization	Score Follower
lo-hi	Orchestra Layout	Structure Visualization	Score Follower
hi-lo	Structure Visualization	Orchestra Layout	Score Follower
hi-hi	Score Follower	Orchestra Layout	Structure Visualization

Personalized music visualization system

Recommending visualization:

- Cluster users with respect to their answers to BFI-7 and -18
- Split at median value into lo-lo, lo-hi, hi-lo, and hi-hi groups
- Each cluster has its own preferred visualization
- New users are assigned to a cluster based on their answers and recommended the visualization preferred by similar users

- Prototype: http://bird.cp.jku.at/phenicx_visrecsys/index.php

Evaluation

Experimental setup:

- User study conducted via Amazon Mechanical Turk
- 79 participants, paid 0.35$, task lasted 3 minutes on average
- Participants first asked two questions (BFI-7 and -18), then shown the three visualizations (in randomized order) and asked to rank them after having watched video of each for at least 20 seconds

Performance measure: normalized discounted cumulative gain (nDCG)

Results:

nDCG = 0.87 for our personalized approach
nDCG = 0.82 for random ranking
nDCG = 0.69 for worst possible ranking

Differences statistically significant (t-test at p = 0.03)

Conclusions

- Investigated three visualizations for classical orchestra performances: Score Follower, Orchestra Layout, and Structure Visualization
- User study on relationship between personality traits (BFI) and visualization preferences (PQ) showed substantial correlations
- Two most significant BFI questions used to cluster users and build a personality-based adaptive system to order the different visualizations
- User study showed that personalized approach is preferred over non-personalized (nDCG, t-test)