

UGEB2149 Music, Mind and Artificial Intelligence

Course outline, 2019-20 Term 2

(This outline is tentative and subject to change.)

Teacher Information

Lecturer	Email	Phone	Office
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General Information

Lecture period	Room
Mon 12:30PM - 02:15PM	LG04, Hui Yeung Shing Building

Course Description

Music is an art and a science. Questions like “how do we perceive music,” “how does music arouse emotions in us,” “can artificial intelligence (AI) perceive music like us,” “how can AI recognize emotions expressed in music,” “can AI arouse emotions in us through music” are all scientific in nature. This interdisciplinary course invites students to analyse and appreciate music from two scientific perspectives, namely, psychology and AI. It begins with musical elements, which are the basic building blocks of music, from the viewpoint of both music perception and production. The science behind those elements is explored with an emphasis on how they evoke emotions. We then examine the basic concepts of AI and its capability of producing music applications including music emotion recognition and automatic music composition. Along with interactive lectures, students will engage in hands-on experiences and class discussions that culminate towards various music-related AI projects. **No prior knowledge in music or programming is required.**

Learning Outcomes

Upon completion of the course, students will be able to:

- Understand the concepts of music fundamentals from the scientific perspective.
- Explain how one perceives music via the empirical studies in music psychology and understand the scientific methods employed in those studies.
- Explain how computers can use AI to learn from data, identify patterns and make decisions with minimal human intervention.
- Demonstrate the competency in designing and implementing music applications with the technology of AI.
- Appraise and evaluate the impact of AI on music listeners, music industry and the society.
- Reflect in depth about critical similarities, differences, and intersections between how we and AI hear music so as to demonstrate how music is both an art and a science.

Assessment

Mid-term exam (multiple-choice questions)	30%
2 assignments	25%
Individual project or essay	25%
Participation	20%

Course Schedule

Week	Date	Topic
Week 1	Jan 6	Overview: music, mind and AI
Week 2	Jan 13	How do we hear music? Perceiving musical elements 1
Week 3	Jan 20	How do we hear music? Perceiving musical elements 2
Week 4	Jan 27	No class. Lunar New Year Vacation
Week 5	Feb 3	How do computers “hear” music? Musical elements and signal representation
Week 6	Feb 10	How does AI work? Conceptual foundations of machine learning
Week 7	Feb 17	Hands-on experience: building a music AI project with Microsoft Azure (lab 1)
Week 8	Feb 24	How do we make sense of music? From the theories of music and emotion to the cognition of musical structure
Week 9	Mar 2	How does AI recognize music emotions? Techniques of music emotion recognition
Week 10	Mar 9	Mid-term exam; Hands-on experience: building a music AI project with Microsoft Azure (lab 2)
Week 11	Mar 16	Hands-on experience: unfolding the creative mind through musical performance
Week 12	Mar 23	Hands-on experience: unfolding the creative mind through music composition
Week 13	Mar 30	No class. Reading week
Week 14	Apr 6	Can AI be creative? Techniques of automatic music composition; Conclusion: music, mind and AI in the future
Week 15	Apr 13	No class. Easter holiday

Course Materials

Selected references

- Kerman, Joseph, Vivian Kerman, and Gary Tomlinson. *Listen*, 8th edition. W.W. Norton, 2016.
- Bamberger, Jeanne. *Developing Musical Intuitions*. Oxford University Press, 2000.
- Thompson, William Forde. *Music, Thought, and Feeling: Understanding the Psychology of Music*, 2nd edition. Oxford University Press, 2014.
- Burg, Jennifer, et al. *Digital Sound & Music: Concepts, Applications, and Science*. Franklin, Beedle & Associates Inc, 2016. Online version: <http://digitalsoundandmusic.com/>
- Kelleher, John D. *Deep Learning*. The MIT Press, 2019.
- Weihs, Claus, et al. *Music Data Analysis: Foundations and Applications*. CRC Press, 2017.

Other information

Academic honesty and plagiarism

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at <http://www.cuhk.edu.hk/policy/academichonesty/>.

Grade descriptors

- A Outstanding performance on all learning outcomes.
- A- Generally outstanding performance on all (or almost all) learning outcomes.
- B Substantial performance on all learning outcomes, OR high performance on some learning outcomes which compensates for less satisfactory performance on others, resulting in overall substantial performance.
- C Satisfactory performance on more than 50% of learning outcomes, possibly with a few weaknesses.
- D Barely satisfactory performance on a number of learning outcomes.
- F Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements