

Courses in English Course Description

Department MUC.DAI

Course title **AI in Culture and Arts (AICA) - Human-AI Interaction**

Course number 804

Hours per week (SWS) 2

Number of ECTS credits 2

Course objective Artificial intelligence (AI) is increasingly impacting the cultural and creative sectors. In particular, machine learning algorithms can now generate unprecedented synthetic media, transforming how we create, produce, and distribute art and culture. Students must develop a theoretical and practical understanding of machine learning to comprehend such transformative technology and foster the development of meaningful human-AI interactions.

This course addresses this need and delves into interactive machine learning for the cultural and creative sectors. The course is intended for art, cultural management, design, and computer science students.

After this course, students will master the theoretical and technological foundations of machine learning, be able to train and (critically) evaluate machine learning models, and deploy them in meaningful interactive systems.

The course is structured in three 2-day blocks (6 days in total). Each block provides theoretical lectures and hands-on activities to develop interactive machine-learning systems for image, sound, and text-based applications in the creative and cultural sectors. Every teaching day starts with a lecture and discussion in the morning, followed by a hands-on session on the same topic in the afternoon.

Learning outcomes

After successful participation in this course, students are able to:

- Understand the history and current state of AI: students will be able to explain the different waves of AI (symbolic, connectionist), precisely identify machine learning algorithms, and explain their distinctive characteristics (dataset, optimization, loss, etc.).

- Train and (critically) evaluate a machine learning algorithm: students will be able to explain and apply the main steps of the development cycle of machine learning, from data collection, analysis, preprocessing, training, and evaluation. They will be able to critically examine a learning curve and performance metrics to assess the performance of their machine-learning models. Furthermore, they will be able to critically discuss the limitations of their model from the content of their dataset and from the perspective of bias and fairness.

Prerequisites This module is aimed at all students enrolled in a third-year Bachelor's program at Hochschule München University of Applied Sciences (HM) or the Hochschule für Musik und Theater München (HMTM). Students in Master's programs are also welcome; it is thus designed as an interdisciplinary venue that brings together a range of perspectives. Students with prior computer science and machine learning knowledge will be assigned dedicated and more advanced activities to develop interactive ML systems using the open source [Marcelle toolkit](<https://marcelle.dev/>).

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Recommended reading	<p>General culture:</p> <ul style="list-style-type: none"> - Cardon, D.; Cointet, J.-P.; Mazières, A.; Carey-Libbrecht, L., 2018. *Neurons spike back*. Réseaux 211, 5, 173-220. https://doi.org/10.3917/res.211.0173 - Anantrasirichai, N.; Bull, D., 2022. *Artificial intelligence in the creative industries: a review*. Artificial Intelligence Review - Caramiaux, B. et al, 2019. *AI in the media and creative industries*. New European Media (NEM). - Caramiaux, B. 2023. *AI with Museums and Cultural Heritage*. In: Sonja Thiel/Johannes C. Bernhardt, *AI in Museums* (117-130). Bielefeld: transcript Verlag. https://doi.org/10.14361/9783839467107-011 - Briot, J.-P.; Hadjeres, G.; Pachet, F.-D., 2019. *Deep learning techniques for music generation -- a survey*. arXiv:1709.01620 [cs.SD] - Fiebrink, R. 2019. *Machine learning education for artists, musicians, and other creative practitioners*. ACM Transactions on Computing Education (TOCE) 19, 4, Article 31 (September 2019), 32 pages. https://doi.org/10.1145/3294008 <p>Practical resources:</p> <ul style="list-style-type: none"> - Françoise, J.; Caramiaux, B.; Sanchez, T., 2021. *Marcelle: composing interactive machine learning workflows and interfaces*. In: UIST '21: The 34th Annual ACM Symposium on User Interface Software and Technology, October 10-13, 2021, Virtual Event, USA. ACM, New York, NY, USA, 15 pages. https://marcelle.dev/ - Géron, A., 2019. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* - Fleuret, F., 2023. *The Little Book of Deep Learning*. A lovely concise introduction. https://fleuret.org/dlc/
Teaching methods	Thematic lectures with associated practical work.
Assessment methods	Students will be graded based on their completion of the hands-on activities.
Language of instruction	English
Name of lecturer	Dr. Benedikt Zönnchen, Dr. Téó Sanchez
Email	zoennchen.benedikt@hm.edu teo.sanchez@hm.edu
Link	https://aica-crash-course.github.io
Course content	<p>Structured over three 2-day blocks (6 days in total), the course addresses:</p> <ol style="list-style-type: none"> 1. Image: This introductory block focuses on image classification through machine learning. After a general introduction to AI's history and current state, participants will explore the machine learning development cycle, engaging with dedicated interactive applications (made with Marcelle) and computational notebooks in Python. The hands-on session will focus on training and evaluating museum artifacts using open-access and open-source datasets (MAMe, Smithsonian Open Access). 2. Sound: The second block centers on musical applications. Students will be guided to create a regression model from physical gestures to sound using an open-source visual programming language for music and art (Pure Data). Participants will learn Pure Data basics and discover how to transform their smartphones into synthesizers. The more advanced students will also approach symbolic music generation using traditional programming (computational notebooks in Python). 3. Text: Building on the first block, this third bloc explores the use of machine learning to "embed" and navigate cultural archives. Students will use multi-modal models that link images to textual descriptions to design interactive tools for exploring and retrieving artifacts in museum archives. The more advanced students will be able to train their own embedding models on personalized datasets in Python.
Remarks	