The Hong Kong University of Science and Technology

Division of Arts and Machine Creativity (AMC)

AMCC5140, in Fall 2025/26

Course code: AMCC5140 (3 credits)
Course title: AI for Visual Arts and Creativity
Abbreviated title: AI4VAC
Course instructor: Prof. Anyi Rao
Target students: AMC MA/PhD and EMIA IIP PhD
Class quota: 30
Grading requirement: Letter grades

Course description:
This course explores AI (especially machine learning) techniques for creating visual content in images and videos. The objectives of synthesis research range from modeling statistical distributions of visual data to creating realistic, picture-perfect graphics. Additionally, we delve into interactive tools for artistic expression. Throughout the course, we'll cover key machine learning algorithms, including classical methods and deep learning models such as ConvNets, GANs, and Diffusion models. Students will gain practical skills to build applications and create new visual effects using their own photos and videos.

Enrolment requirement: N.A.

Course Intended Learning Outcomes
On successful completion of the course, students will be able to:

1. Get a foundation in image editing and synthesis including texture synthesis and style transfer, image colorization and inpainting, video generation and editing, image-to-image translation, image and video editing.
2. Get a foundation of machine learning concepts including (fast) Nearest neighbor search, principal component analysis, gaussian mixture model, markov Random Field (MRF), convolutional neural networks, deep generative models: Auto-encoder, Generative Adversarial Networks, Flow-based models, Variational Auto-encoder, Autoregressive Models, Diffusion Models, Conditional generative models, Neural Radiance Fields (NeRF)
3. Develop tools for their own creation and have some cool results with own visual contents

Teaching and learning activities:

1. Lectures and discussions (40%):
    - Regular lectures covering fundamental concepts, algorithms, and techniques related to visual content creation.
    - Engage discussions on research papers, case studies, and real-world applications.
2. Critiques and feedback (20%):
    - Provide constructive feedback from instructors and peers.
    - Iterative improvement of projects based on feedback received.
3. Independent study and exploration (10%):
    - Encourage students to explore additional resources, research papers, and creative projects independently.
    - Self-directed learning to deepen understanding and discover novel approaches.
4. Showcase and presentation (30%)
    - Organize a final showcase where students present their projects and visual effects.
    - Celebrate creativity and innovation within the class

Planned Assessment & Weightings:

Assessment	Percentage
Attendance	15%
Paper Presentation	35%
Course Projects	50%

Weakly Course Outline

Week	Topics	Briefly outline what this topic will cover *(Include reading assignments if available)*	Indicate which course ILOs this topic is related to *(Write CILO-1, CILO-2, etc.)*
1	**Introduction**	Introduction to the course, how images are created and manipulated by humans and machines	CILO-1
2	**Pointwise Processing**	Transformations on images which can be done on raw pixel values as well as image filtering techniques	CILO-1
3	**Image Warping**	Applying global and local geometric transformations to an image	CILO-1
4	**Lighting**	Lighting, diffuse/specular reflectance, albedo, and color vision.	CILO-1
5	**Data-driven Graphics**	What we can do without deep learning, researchers' early exploration on deep learning-based image generation, and how researchers transit from recognition to generation	CILO-1, CILO-2
6	**Convolutional Network for Image Synthesis**	Convolutional networks aids in achieving higher quality images by leveraging higher-level knowledge of objects	CILO-2
7	**Paper Reading Week**		
8	**Generative Adversarial Networks**	Generative Adversarial Networks (GAN) principle and architecture.	CILO-2
9	**Diffusion Models**	Diffusion models principle and architecture.	CILO-2
10	**Conditional Generation**	Adding control to content generation	CILO-2
11	**Image Editing with Optimization**	Edit visual content based on optimization	CILO-2
12	**Video Synthesis and Editing**	Generate video based on generative models	CILO-2
13	**Project Presentation**	Final Project	CILO-3

Student learning resources:

Books: Szeliski, Richard. Computer Vision: Algorithms and Applications. Springer Nature, 2022.
Books: Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. *Deep learning*. Vol. 1. Cambridge, MA, USA: MIT press, 2017.