

The Hong Kong University of Science and Technology

Division of Arts and Machine Creativity (AMC)

AMCC5160, in Fall 2026/27

Course code: AMCC5160 (3 credits)
Course title: AI-Driven Animation and Video Generation
Abbreviated title: AI Animation & Video Gen
Course instructor: Harry Yang (Assistant Professor, AMC)
Target students: Postgraduate students interested in AI and creative media
Class quota: 30
Grading requirement: Letter grades

Course description:

This course delves into the intersection of artificial intelligence and visual arts, with a focus on AI-driven animation and video generation. Students will explore modern models including Transformers, diffusion and diffusion-transformer architectures, and autoregressive systems. Through hands-on learning, students implement key components such as LSTMs, attention mechanisms, and diffusion models, gaining the theoretical knowledge and practical skills needed to create and evaluate AI-driven media.

Enrolment requirement: Basic concepts in discrete mathematics and Python programming are required.

Course Intended Learning Outcomes

On successful completion of the course, students will be able to:

1. Understand the key principles behind modern AI-driven animation and video models.
2. Implement AI components such as LSTMs, attention mechanisms, and diffusion models.
3. Analyze the performance and limitations of different AI-driven video and animation models.
4. Design AI-driven models for media generation using state-of-the-art techniques.
5. Apply AI techniques to create animations and videos in real-world projects.
6. Evaluate AI-generated media in terms of quality, consistency, and artistic value.
7. Synthesize AI models to innovate and push the boundaries of creative media production.
8. Present project outcomes, explaining the technical and creative aspects of the work.

Teaching and learning activities:

- Lectures and guided discussions on model principles and creative implications (CILO-1, CILO-3, CILO-6, CILO-7).
- Hands-on labs implementing core components and controlled generation workflows (CILO-2, CILO-4, CILO-5).
- Project studios, critiques, and presentations integrating technical and artistic development (CILO-4, CILO-5, CILO-6, CILO-7, CILO-8).
- Independent study and reading, approximately six hours per week (CILO-1, CILO-3, CILO-6, CILO-7).

Planned Assessment & Weightings:

Assessment	Percentage
Assignments: implementation exercises (CILO-1, CILO-2, CILO-3, CILO-6)	20%
Midterm project and presentation: image-generation prototype (CILO-2, CILO-4, CILO-5, CILO-8)	30%
Final project and presentation: advanced video-generation system (CILO-3, CILO-4, CILO-5, CILO-6, CILO-7, CILO-8)	50%

Weekly 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	Foundations of AI animation and video	Course framing; CNN, RNN, and LSTM foundations. Required: course notes. Recommended: Goodfellow et al., Chapters 6 and 10.	CILO-1, CILO-3
2	Visual and video representations	Latent-variable models, VAE, VQ-VAE, and residual quantization. Required: selected VQ-VAE reading.	CILO-1, CILO-2
3	Attention and sequence modelling	Attention mechanisms and sequence-to-sequence learning. Required: Vaswani et al., 'Attention Is All You Need.'	CILO-1, CILO-2
4	Transformers and autoregressive generation	Vision transformers, tokenization, next-token generation, and temporal modelling. Recommended: selected VideoPoet reading.	CILO-1, CILO-2, CILO-3
5	Diffusion, DDIM, and DiT	Forward/reverse diffusion, sampling, latent diffusion, DDIM, and diffusion transformers. Required: Ho et al.; recommended: Song et al. and Peebles & Xie.	CILO-1, CILO-2, CILO-3
6	Conditioning and efficient adaptation	Text/image conditioning, classifier-free guidance, LoRA, adapters, and controllable generation. Required: selected LoRA and control readings.	CILO-2, CILO-4, CILO-5
7	Midterm project presentations	Demonstration and critique of an image-generation prototype; technical and creative reflection.	CILO-4, CILO-5, CILO-8

Week	Topics	Briefly outline what this topic will cover <i>(Include reading assignments if available)</i>	Indicate which course ILOs this topic is related to <i>(Write CILO-1, CILO-2, etc.)</i>
8	Image-to-video and text-to-video generation	From image synthesis to temporally coherent video; conditioning, motion, and camera control. Required: selected text-to-video reading.	CILO-1, CILO-4, CILO-5
9	Temporal consistency and controllable motion	Identity, geometry, scene, and motion consistency; editing and control strategies; failure analysis.	CILO-3, CILO-4, CILO-6
10	Modern video-generation systems	Case studies of diffusion and autoregressive systems, including Sora, Kling, and VideoPoet. Required: selected technical reports.	CILO-1, CILO-3, CILO-4
11	Evaluation, responsibility, and artistic value	Quality and consistency metrics, human evaluation, provenance, copyright, bias, safety, and critical artistic assessment.	CILO-3, CILO-6, CILO-7
12	Final project studio	Model integration, experimentation, ablation, critique, and technical/creative refinement with instructor feedback.	CILO-4, CILO-5, CILO-6, CILO-7
13	Final project presentations	Presentation and critique of an advanced AI-driven animation or video-generation project.	CILO-5, CILO-6, CILO-7, CILO-8

Student learning resources:

- Required: course notes and selected research papers or technical reports assigned by week.
- Recommended: Hands-On Generative AI with Transformers and Diffusion Models (Sanseviero et al., O'Reilly, 2024).
- Recommended: Deep Learning (Goodfellow, Bengio, and Courville, MIT Press, 2016), plus selected papers on Transformers, diffusion models, DiT, controllable generation, and video evaluation.