## Advanced Multimedia Processing

Our main research fields are artificial intelligence, multimedia, computer vision, pattern recognition, and machine learning. We mainly focus on (1) attractiveness computing based on multimedia big data analysis, (2) frontiers in pattern recognition and machine learning, (3) video understanding and generation, and so on. In addition, we are also working on other new research fields. We also welcome new research topics. We collaborate with a lot of international companies and universities. Therefore, we can touch real-world data and get feedbacks from real services.

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### Attractiveness Computing

We are interested in analyzing why and how we are attracted to specific persons, content, and services. We have been trying to analyze and even enhance such “attractiveness” in multimedia big data.

1. Presentation and online-lecture analysis
2. Impression analysis of CMs and ads
3. Social popularity analysis and enhancement in SNSs
4. Consumer behavior analysis
5. Online marriage consulting and child care support
6. Photo editing (digital makeup, Instgrammability)
7. Photo/video quality assessment and enhancement
8. Real-estate tech (ReTech) using AI and IoT
9. Fashion image analysis and recognition
10. Travel recommendation (route design, photo shooting)

### Machine Learning and Pattern Recognition

We have been working on novel image recognition and machine learning algorithms, not simple extensions of existing algorithms.

* Progressive domain adaptation
  We have been working on transfer learning for cross-domain object detection for novel image styles.
* Reinforcement learning and meta learning
  We developed a pixel-wise reinforcement learning (pixel-RL) method for the first time in the world and successfully applied it to a lot of image processing. In addition, we have been working on meta learning that can take advantage of classical approaches and DNN-based approaches.
* Learning with few/incomplete training data
  In practical scenarios, we cannot have enough number of training data. To solve this problem, we have been working on weakly-supervised learning and few/zero-shot learning.
* More reliable training
  We have been working on understanding mechanisms and its defense of adversarial examples (AES). Besides, we are proposing a new attacking/defense approach which we call inverse adversarial attack.

### Video Understanding and Generation & Misc.

We have been working on understanding, summarization, and automatic generation of videos using new techniques such as volume attention and reinforcement learning. Videos are more challenging as compared to images because of its temporal information.

Besides, we are also challenging new research topics aiming at practical applications.

1. Efficient and intuitive multimedia data retrieval
2. Medical image analysis and pandemic prediction
3. Nursery school sensing using IoT cameras
4. Analysis of text chats and communications
5. Factorization of characters and illustrations using DNNs

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