

# MU ZHOU

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## EDUCATION

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**University of Tsukuba** - *Tsukuba, Japan*

04/2017 - 03/2020

Master of Science in Computer Science

Dissertation title: Few-shot classification with data augmentation

Advisor: Hidemoto Nakada

**Changsha University of Science and Technology** - *Changsha, China*

09/2012 - 06/2016

Bachelor of Engineering in Software Engineering

## RESEARCH INTERESTS

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My goal is to understand what makes visual imagination possible in the brain, and the neural basis for learning and memory. My research interest is to build brain inspired AI, make AI more robust and less data hungry. I am excited to tackle such real-world problems with new algorithm development.

**Research topics:** Few-shot Learning, Domain Adaptation, Pose Estimation

## RESEARCH ACTIVITIES

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### *Preprint*

Jessy Lauer, **Mu Zhou**, Shaokai Ye, William Menegas, Tanmay Nath, Mohammed Mostafizur Rahman, Valentina Di Santo, Daniel Soberanes, Guoping Feng, Venkatesh N. Murthy, George Lauder, Catherine Dulac, Mackenzie W. Mathis, Alexander Mathis, *Multi-animal pose estimation and tracking with DeepLabCut*.

### *Publication*

Shaokai Ye, Kailu Wu, **Mu Zhou**, Yunfei Yang, Sia Huat Tan, Kaidi Xu, Jiebo Song, Chenglong Bao, Kaisheng Ma, *Light-weight data calibrator: A separable component for unsupervised domain adaptation*, The 2020 Conference on Computer Vision and Pattern Recognition (**CVPR2020**).

**Mu Zhou**, Yusuke Tanimura, Hidemoto Nakada, *Few-shot Learning with Data Augmentation with Generative Model*, The 34th Annual Conference of the Japanese Society for Artificial Intelligence (**JSAI2020**).

**Mu Zhou**, Yusuke Tanimura, Hidemoto Nakada, *One-shot Learning using Triplet Network with kNN classifier*, The 33rd Annual Conference of the Japanese Society for Artificial Intelligence (**JSAI2019**).

### *Workshop*

**Mu Zhou**, Yusuke Tanimura, Hidemoto Nakada, *Image synthesis for One-shot Classification with Triplet Network*, The 22nd Information-Based Induction Sciences Workshop (**IBIS2019**).

**Mu Zhou**, Hidemoto Nakada, Yusuke Tanimura, *One-shot Learning using Triplet Networks with KNN*, The 21st Information-Based Induction Sciences Workshop (**IBIS2018**).

## RESEARCH EXPERIENCE

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### **Research Assistant**

02/2021 - Present

EPFL – Mathis Group

Geneva, Switzerland

Pose estimation for animals is the key to understand animals' behavior and thus the key to understand the neural circuit behind behaviors. While previous methods use marker based methods to extract poses, deep learning based frameworks such as DeepLabCut used marker-based approach. This change is quite important especially for small animals that do not cooperate with markers. I work with the team of DeepLabCut to support multiple animal pose estimation and pose tracking for lab animals. The unique

challenge is that with relatively few annotated frames, it's rather hard to distinguish animals interact very closely (unlike humans). After I joined the team, I proposed a new architecture called DLCNet that leverages multiple resolution fusion module and multiple stage decoder with residual connections. The novel architecture improves our baselines up to 9% on mAP and largely solve difficult cases when animals overlap. This work is about to be submitted to a journal where I am a second author for my contributions.

### Student Researcher

04/2017 - 03/2020

*National Institute of Advanced Industrial Science and Technology – AIRC*

*Tsukuba, Japan*

Few-shot learning describes a method that makes deep learning models generalize from a few examples to more general concepts. Domain adaptation attempts to learn domain invariant features for cross-domain tasks. These powerful ideas have allowed models to require less labeled data to generalize. During this time, I worked on both few-shot learning and domain adaptation, which lead to publications in several conference (JSAI 2019, 2020 and CVPR 2020). The work presented in JSAI showed that contrastive learning combined with generative model can significantly improve the image classification in extreme low data regime. The classification performance improved to 78.4% from baseline 46.8%. The work presented in CVPR 2020 showed that it's possible to learn a light-weight calibrator to calibrate inputs to achieve domain adaptation.

## RESEARCH PROJECTS

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### Multi-animal pose estimation and tracking with DeepLabCut

02/2021 - Present

*EPFL - Mathis Group*

- Proposed a multi-fusion module and multi-stage decoder to the baseline architecture.
- Improved the performance of multi-animal pose estimation up to 9% on mAP in different datasets.

### Few-shot Classification with data augmentation

04/2019 - 03/2020

*University of Tsukuba, National Institute of Advanced Industrial Science and Technology*

- Improved the performance of generative models on limited training dataset.
- Boosted the accuracy on few-shot classification from 56.4% to 78.4%.

### Image synthesis for One-shot Classification with Triplet Network

10/2018 - 03/2019

*University of Tsukuba, National Institute of Advanced Industrial Science and Technology*

- Proposed a Triplet Network model based on contrastive learning to one-shot classification scenario.
- Proposed a Conditional VAE model to generate images to do data augmentation.
- Improved the classification accuracy from baseline 46.8% to 56.4%.

## WORK EXPERIENCE

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### Algorithm Engineer

04/2020 - 10/2020

*Buou Tech Inc. – AI Lab*

*Beijing, China*

- Coordinated data analysis and algorithm team, built efficient dataset.
- Built the face swap model comprising an autoencoder with a GAN.
- Proposed the algorithm to improve the quality of generated images by traditional image processing methods.

## HONORS AND AWARDS

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Excellent Graduate Student Scholarship (Top 3%), CSUST

2016

First-class Scholarship (Top 5%), Second-class Scholarship (Top 15%), CSUST

2012 - 2016