

Mengwei Ren

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Research Interests

Computer Vision, Machine Learning, Medical Image Processing.

Education

2018 - present **Ph.D.**, *Computer Science*, Tandon School of Engineering, New York University.
Advisor: Prof. Guido Gerig.

Relevant courses: Machine Learning, Deep Learning, Artificial Intelligence, Computer Vision, Probability and Statistics for Data Science, Theory of Computation.
GPA: 3.94/4

2014 - 2018 **B.S.**, *Computer Science*, School of Computer Science and Technology, East China Normal University.

Relevant courses: Algorithm Analysis and Design, Object Oriented Programming and C++, C Programming, Matlab Programming.
Thesis: 3D Deep Dense Descriptor for Volumetric Shapes with Adversarial Networks.
GPA: 3.69/4, Major GPA: 3.78/4, Rank: 1/103.

Research Experience

Aug 2019 - present **Research Assistant**, *Visualization, Imaging and Data Analysis (VIDA) Lab, NYU Tandon, Computer Science, supervised by Prof. Guido Gerig.*

- **Segmentation-Aware Feature Modulation for Unpaired Image Harmonization.**
 - Developed a framework to eliminate scanner-effects while preserving anatomical structures;
 - Improved on cycle-consistent adversarial methods with a novel segmentation-aware renormalization layer so as to regularize the image translation;
 - Validated the proposed methodologies across diverse imaging modalities (T1w MRI, FLAIR MRI, and OCT) via sample fidelity, sensitivity to translation perturbation, and post-hoc segmentation accuracy scores.
- **Q-space Conditioned Translation Networks for Directional Synthesis of Diffusion Weighted Images from Multi-modal Structural MRI.**
 - Propose a structural to diffusion MRI translation GAN with Q -space conditional priors;
 - The approach yields improved DWI synthesis accuracy and fidelity with enhanced downstream utility as quantified by the accuracy of scalar microstructure indices estimated from the synthesized images.
- **On going project: Anatomy, Modality and Age Factorization for Multimodal MRI Translation and Segmentation.**
 - Propose a deep model to factorize the image latent space into modality, anatomy and age encoding, so as to perform longitudinal segmentation, and multimodal translation;
 - Apply constraints on in-domain reconstruction, cross-domain translation, and multimodal segmentation to ensure the effectiveness of feature decomposition.

- May 2021 - **Machine Learning Research Intern**, *PCT REC group, Siemens Healthineers*,
Sept 2021 *Princeton, NJ, supervised by Dr. Marriappan Nadar.*
Work on deep learning based susceptibility distortion correction of images with opposite phase-encoding directions.
- Aug 2017 - **Research Assistant**, *Multimedia and Visual Computing Lab, NYU Tandon, Computer Science*,
July 2019 *supervised by Prof. Yi Fang.*

Publications

- Journal paper **Mengwei Ren***, Neel Dey*, James Fishbaugh, Guido Gerig, "Segmentation-Renormalized Deep Feature Modulation for Unpaired Image Harmonization", *IEEE Transactions on Medical Imaging (TMI)*, 2021.
- Conference paper **Mengwei Ren***, Heejong Kim*, Neel Dey, Guido Gerig, "Q-space Conditioned Translation Networks for Directional Synthesis of Diffusion Weighted Images from Multi-modal Structural MRI", *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, oral presentation, 2021.
- Neel Dey, **Mengwei Ren**, Adrian Dalca, Guido Gerig, "Generative Adversarial Registration for Improved Conditional Deformable Templates", *International Conference of Computer Vision (ICCV)*, 2021.
- Jing Zhu, Yunxiao Shi, **Mengwei Ren**, Yi Fang, "MDA-Net: Memorable Domain Adaptation Network for Monocular Depth Estimation", *British Machine Vision Conference (BMVC)*, 2020.

Honors

- 2020-2021 **Tandon School of Engineering (SOE) Fellowship**, NYU.
- Sept, 2017 **Shanghai Government Scholarship**, *China*, Top 3%.
- Sept, 2016 **Academic Excellence Scholarship**, *ECNU*, Top 4%.
- Dec, 2016 **Third prize of the Internet Application Development Contest**, *China*.
- Sept, 2015 **Outstanding student**, *Department of Information and Technology, ECNU*.

Selected Academic Projects

- 2020 Neonatal segmentation for over 100 subjects without expert labels via style transfer: Trained and applied CycleGANs for translating the T2 appearance of neonates towards dHCP dataset, so as to employ dHCP-specific DrawEM on the translated images.
- 2019 Generative Adversarial Visual Object Network: Jointly synthesize 3D shapes and 2D images via a disentangled object representation with three factors: shape, viewpoint and texture.
- 2018 Deep Reinforcement Learning on Pacman: Implemented (with TensorFlow) and trained Deep Q-Learning algorithm on Pacman game.

Skills

- Programming PYTHON, C/C++, MATLAB, JAVASCRIPT, HTML.
- Software & Libraries Pytorch, Tensorflow, FSL, ITK-SNAP, ANTs, 3D Slicer, Tableau.