Ningkun Zhou

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Machine Learning Engineer with **5 years of experience**, specializing in computer vision applications in industrial and scientific settings

EDUCATION

B.Sc. Genetics and Computer Sciences **Sep 2015 – May 2019**
University of Wisconsin, Madison

WORK EXPERIENCE

Algorithm Engineer - *Danieli China* **Apr 2022 – Jul 2024**
Developed Deep Learning-based Automatic Scrap Classification system for multiple steel plants.

- **Auto-adaptive PTZ camera**: I developed an auto-adaptive image acquisition system designed to consistently capture unique, high-resolution zoomed-in images. Leveraging **YOLO**, **Deep SORT tracking** and **image registration** algorithms, the system precisely identifies new layers of exposed scrap for detailed imaging. Each zoomed-in image maintains a stable scale, matching the width of the unloading truck. This stability is achieved through a **PTZ vs. XY-Mag** calibration algorithm that I developed.
- **Scrap Net**: Customized and fine-tuned popular **instance segmentation** architectures to production level, handling large quantities of annotation data, exceeding 25,000 images and **100,000 polygons** per dataset. Decoupled the original software into multiple API and MQ-based **microservices**, which enhanced system stability. Collaborated closely with customers to optimize the recognition system, achieving an accuracy rate of **90% to 95%**. Under my leadership of the algorithm team, our product have dominated the domestic market, with over 5 projects successfully accepted.
- **Innovations:**
  - **CLIP**: Fine-tuned and deployed the CLIP model to reduce the need for extensive image classification annotations by encoding text prompts and image features. Achieved a 30% higher accuracy compared to the baseline EfficientNet model with the same amount of annotated data, reaching a 90% accuracy with only 200 images.
  - **Bale Breaker**: Developed the **first-in-market** quality assessment system for automatic monitoring of the scrap metal bale breaking process. Implemented **mechanical arms** to capture multi-angle interior images without disrupting on-site operations once the bale is dismantled. Achieved a classification accuracy of 95%.

Research Assistant - *Chinese Academy of Sciences, GIBH* **Jun 2019 – Apr 2022**
Employed both conventional and innovative methods to resolve protein structures.

- **Cryo-EM** [1],[2]: Applied advanced cryogenic-electron microscopy techniques to resolve multiple protein structures, managing all phases from data collection, particle extraction, **unsupervised clustering**, to reconstruction of 2D projections into 3D density maps and atomic-level protein model building. Contributed to two publications in high-impact journals, with **co-first author** status on one.
- **Cryo Check**: Developed a deep learning-based tool for cryo-EM micrograph quality assessment, facilitating **real-time** evaluation during Cryo-EM data collection. This innovative approach significantly reduced time and eliminated human bias in the selection of raw EM data. https://github.com/nzhou26/cryoCheck
- **Particle Seg**: Semantic segmentation tool for cryo-EM particles. It accurately segments a cryo-EM particle into three parts: signal, background, and edge. From the segmented ROI, for some cases, final resolution could be improved by 0.5 angstrom. https://github.com/nzhou26/particleSeg

SKILLS

- **Machine Leaning**: EfficientNet, U-Net, Mask R-CNN, YOLO, K-means clustering, CLIP
- **Programming**: Python (Tensorfow, Pytorch, Detectron2, Numpy, Pandas, Matplotlib), SQL, Bash
- **Miscellaneous**: Linux, Docker, Redis, RabbitMQ, RESTful API, PLC, Socket

PUBLICATIONS

1. S. Dong, H. Li, **N. Zhou**, et al., "Structural basis of nucleosome deacetylation and DNA linker tightening by Rpd3S histone deacetylase complex," *Cell Research*, 2023. DOI: 10.1038/s41422-023-00869-1.
2. L. Tang, S. Dong, **N. Zhou**, et al., "Vibrio parahaemolyticus prey targeting requires autoproteolysis-triggered dimerization of the type VI secretion system effector RhsP," *Cell Reports*, 2022. DOI: 10.1016/j.celrep.2022.111732.