

# Zhongliang Guo

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## Skills

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Keywords: AI, Deep Learning, Machine Learning, Computer Vision, CNN, Transformer  
Programming Lang: Python, JAVA, SQL, C#, JavaScript, LaTeX, HTML5, Visual Basic, .NET  
Related Library: PyTorch, OpenCV, NumPy, Pandas, scikit-learn, Matplotlib, TensorFlow

## Education

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PhD *Computer Science*, [University of St Andrews](#), *Full scholarship*, Supervisor: [Oggie](#) and [Lei](#) 2022 - Now  
MSc *Artificial Intelligence* with **Distinction**, [University of St Andrews](#), Nominated on 2021/2 *Deans' List* 2021 - 2022  
BSc *Forensic Science*, [NWUPL](#), GPA: 88.4/100, Awarded 2021 Outstanding Undergraduate Dissertation 2017 - 2021

## Research Experience

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- Artwork Protection Against Neural Style Transfer Using LAACA** Aug 2023 - Jan 2024
  - Main contributor.** Proposed a novel method Locally Adaptive Adversarial Color Attack, **LAACA**, that leverages the concept of adversarial attack to avoid unauthorized use of artwork by neural style transfer
  - Implemented a **frequency-dependent** perturbation generation method to balance the performance of attack and visual integrity of the post-attack image
  - Provided a solution that allows artists pre-process their works by once, then almost all popular style transfer methods will not be able to “steal” their artwork style
  - Delivered a robust assessment baseline for those authorized neural style transfer
- Semi-Supervised Crowd Counting with Masked Modeling by Contrastive Learning** May 2023 - Aug 2023
  - Main contributor.** Proposed a novel semi-supervised crowd counting framework, **MRC-Crowd**, that leverages unlabeled images to help models develop a **holistic understanding** of crowd scenes
  - Implemented a **masked regularization technique** to enhance the generalization of the model
  - Designed a simple but efficient **fine-grained density classifier** to help capture relationships between density levels
  - Achieved **SOTA** on multiple benchmark crowd counting datasets, reduced error by over **13%** on average
- A White-Box False Positive Adversarial Attack on Contrastive Loss-Based Models** Jan 2023 - Aug 2023
  - Main contributor.** Proposed a **novel** false positive (FP) attack on **contrastive loss-based** signature verification systems
  - Demonstrated the effectiveness of **style transfer** by transferring the texture of the target into the generated perturbation
  - Key contributions include the novel FP attack method, effective style transfer components, and superior performance compared to other white-box attacks
- Deep Learning for Forward and Inverse Design of Disorder Waveguide** Sep 2022 - Nov 2022
  - Joint collaborator as the **algorithm designer** of this interdisciplinary subject within Physics.
  - Implemented conditional GAN with Wasserstein distance loss to explore design space of random waveguides in linear regime
  - Employed **convolutional neural network groups** (CNNg) to predict linear and nonlinear behavior of random waveguides
  - Addressed three main inverse design problems: replicating geometries with equivalent responses, enhancing transmission, and predicting new geometries for unseen spectra
- A Siamese Transformer Network for Zero-Shot Ancient Coin Classification** April 2022 - Aug 2022
  - Main contributor.** Designed and implemented a **zero-shot learning** on an **extremely uneven dataset** for ancient coins (**100,000** images in **thousands categories**, number of sample in the category ranges from **1** to **1,000+**)
  - Combined **Vision Transformer** with **Siamese Network** architecture on ancient coins for the **first time**
  - Divided the task into several sub-tasks, and obtained a better-performed model through **transfer learning**
  - Achieved **81%** accuracy on **huge testset from unseen categories** with a **very small trainset**  
(Only **566 images from 24 categories** were used for trainset but **14,820 images from 196 categories** for testset)
- A U-net and KMeans based method for brain tumor segmentation and measurement** Jun 2021 - Oct 2021
  - As the main programmer in a 2-person team to implemented a improved **U-net** for **brain tumor segmentation**
  - Boosted segmentation accuracy by **2.6%** after adding some layers
  - Mitigated gradient disappearance and gradient explosion by combining different normalisations
  - First use of **KNN** for brain tumor area calculation

## 8. A Method of Video Recognition Network of Face Tampering Based on Deep Learning Aug 2019 - Oct 2019

- **First inventor.** Led a team of 4 people, developed a method which can recognise videos tampered by deepfakes
- Designed an architecture which has high accuracy and good transferability for distinguishing AI-generated images
- Increased the recognition **accuracy** from 91% to **94.5%** by improving the network structure

## Work Experience

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### 1. Research Assistant

Dec 2023 - Nov 2024

- Doing independent research for drone and bird radar detection project funded by **MathWorks**.
- Bird and drone micro-Doppler data collection.
- Responsible for developing a classification algorithm for drones and birds.

### 2. Teaching Assistant

Sep 2023 - Dec 2023

- As a **demonstrator** for [CS1002 Object-Oriented Programming](#) Lab Session
- Taught the 2023-24 School of Computer Science freshman **Java**
- Teaching range Included *Syntax, Data Type, Control Statements*, etc.

## List of Publication & Patent

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- **Zhongliang Guo**, Junhao Dong, Yifei Qian, Kaixuan Wang, Weiye Li, Ziheng Guo, Yuheng Wang, Yanli Li, Ognjen Arandjelović, and Lei Fang. [Artwork Protection Against Neural Style Transfer Using Locally Adaptive Adversarial Color Attack](#). **In submission to 27th European Conference on Artificial Intelligence**, 2024.
- **Zhongliang Guo**, Weiye Li, Yifei Qian, Ognjen Arandjelovic, and Lei Fang. [A White-Box False Positive Adversarial Attack Method on Contrastive Loss-Based Offline Handwritten Signature Verification Models](#). In *Proceedings of The 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*, volume 238, pages 901–909. PMLR, 2024.
- **Zhongliang Guo**, Ognjen Arandjelović, David Reid, Yaxiong Lei, and Jochen Büttner. [A Siamese Transformer Network for Zero-Shot Ancient Coin Classification](#). *Journal of Imaging*, 9(6):107, 2023.
- **Zhongliang Guo**. [The development and comparison of face recognition algorithms based on different technical characteristics](#). In *2020 International Conference on Computer Vision, Image and Deep Learning*, pages 6–10. IEEE, 2020.
- **Zhongliang Guo**, Dian Jia, Zhaokai Wang, and Yongqi Zhou. [A Method of Video Recognition Network of Face Tampering Based on Deep Learning](#), A.U. Patent 2019101186A4, Oct. 2019.
- Yifei Qian, Liangfei Zhang, **Zhongliang Guo**, Xiaopeng Hong, Ognjen Arandjelović, and Carl R Donovan. Perspective-assisted prototype-based learning for semi-supervised crowd counting. **In submission**, 2024.
- Yifei Qian, Xiaopeng Hong, **Zhongliang Guo**, Ognjen Arandjelović, and Carl R Donovan. [Semi-Supervised Crowd Counting with Masked Modeling: Facilitating Holistic Understanding of Crowd Scenes](#). **Just accepted by IEEE Transactions on Circuits and Systems for Video Technology**, 2024.
- Hanxu Hu and **Zhongliang Guo**. [A U-net and KMeans based method for brain tumor segmentation and measurement](#). In *2021 International Conference on Computer Vision, Image, and Deep Learning (CVIDL)*, volume 11911, pages 407–413. SPIE, 2021.