

# Wei-Cheng Wang, Ph.D.

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## Summary

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PhD Researcher with **10+ yrs research** experience on **unlabeled streaming data** (audio, video, and multimodal data), including **5000+ hours** of **uncurated audio** and extended **video** streams collected across multiple cities and years. Research bridges **lab to real-world deployment**, tackling **domain shift**, **source-free** and **unsupervised** settings, while providing solutions in **privacy-preserving ML** and **general-purpose** representation. Recognition includes 12 peer-reviewed **articles (140+ citations)** with **4 first-author journals** (2 Top 10%, 1 Top 25%) and **ICIP** (first-author, oral), **APICTA** award (team lead, representing Taiwan), and **Top 3%** master's graduate honor.

## Skills

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- **Domain Expertise:** Machine Learning, Deep Learning, Multimodal ML (Audio/Video), Self-Supervised Learning, Contrastive Learning, Transfer Learning, Anomaly Detection, Privacy-Preserving AI, Generative Models.
- **Tech Stack:** Python, PyTorch, TensorFlow, scikit-learn, OpenCV, C++, Docker, AWS (ECS, S3), Git, LLM APIs, ChromaDB.

## Experience

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### PhD Researcher | Dec 2025 - Present

*Python, AWS (ECS, S3), Docker, LLM APIs, ChromaDB*

- **Google TPU Research Cloud proposal (under review):**  
Addressing **data** and **label scarcity** via a **controllable compositional synthesis pipeline** with a decoupling-and-recombination approach for **cross-domain transfer** with **explainable AI** (counterfactual and bias evaluation). Targeted application domains include **surveillance**, **defect detection**, and **deepfake** detection, with **cross-environment** event and behaviour **transfer**.
- **Cost-efficient multi-agent LLM orchestration pipeline:**  
Built a **multi-agent LLM orchestration** pipeline on **AWS** (ECS, S3, Docker) for **computational efficiency** profiling and **scalability** evaluation prior to **TPU-scale data synthesis workloads**. Implemented **Mixture-of-Agents** architecture, ChromaDB semantic indexing, and **HDBSCAN** clustering for **cost-efficient LLM API usage**.

### Doctoral Researcher | IDLab, Ghent University-imec, Sep 2019 - Nov 2025

*Funded by the Flanders AI Research Program (Flemish government initiative on data-efficient and reliable AI).*

- **Real-world stress test of SOTA audio models on 5000h of unlabeled streams:**  
With industry partner **AsaSense**, **stress-tested SOTA audio models** under real deployment across **multiple sites** (2 cities, 5 sensors) and **time** (multiple years) periods with uncurated urban audio. Architected a context-aware, **model-agnostic** acoustic surveillance system combining **cloud-side event tagging** and **on-device anomaly detection**, **reducing cloud workload** by **90%**. Identified **lab-to-field gaps** including **domain shift**, **privacy** exposure, and **open-set** events; summarized findings into a technical report for our industry partner.
- **Single-model audio-visual representation for multi-task edge deployment:**  
Built a **general-purpose, self-supervised** representation learning framework supporting **multi-task** downstream **applications**, allowing **efficient deployment** on **resource-constrained edge devices**. Recovered **false negatives** in **contrastive learning** for more information-rich representations, yielding **~10% gain** over baselines. Tackled the **gap** between **current benchmark assumptions** and **real-world** audio-visual streaming **data**. (Published in *Frontiers in Robotics and AI*)
- **On-device opt-in audio privacy without downstream model retraining:**  
Implemented the **first opt-in** framework in the **voice privacy** domain, deployable as a **plug-and-play** module with **real-time inference** demonstrated on **Jetson TX1** (34 ms per 1-second audio clip). Two **CycleGAN-VC2**-based models engage in **adversarial learning** to **reduce privacy leakage** to near **zero**. Challenged the **overlooked gap** between **opt-out** assumption in **benchmarks** and **opt-in** principle of EU **General Data Protection Regulation**. (Published in *IEEE Pervasive Computing and Applied Intelligence*)
- **Model selection for general-purpose transfer without sharing training data:**  
Proposed a **task-agnostic, source-free, unsupervised transferability assessment** for efficient **domain**

**adaptation** prior to **model fine-tuning**. Forms unbiased reference embeddings with an **ensemble** of **randomly** initialised neural **networks**, then ranks pretrained models by embedding similarity, achieving **0.95/1** against fully supervised ranking without source data and target label. Bridged the **overlooked gap** between **EU Data Act's** model-sharing mandate and **industry** concerns over **data sovereignty** and **IP**. (Published in *Sensors*)

**Teaching Assistant** (Applied Machine Learning) | Ghent University, *Sep 2021 - Feb 2023*

- **Collaborated with Sony DepthSensing Solutions:**

Co-designed a [computer-vision project](#) with **Sony DepthSensing Solutions**, from sensor data acquisition to gesture-recognition PoC delivery.

**Pre-PhD Research** | NCKU and Academia Sinica, *Sep 2014 - Jun 2016, Sep 2017 - Jul 2019*

*C++, Tensorflow, OpenCV, MATLAB*

- **Turned research into an award-winning prototype, pitched to industry and academic juries:**

Spun off the research direction into a **startup pitch**. Engineered the core **prototype (video event analysis)** and presented business plans to industry and academic juries; won **1st** at **InnoServe Awards** and **Top 3** at **APICTA (representing Taiwan)**.

- **Multimodal driver monitoring with national automotive R&D partner:**

Collaborated with **ARTC** (Automotive Research and Testing Center, Taiwan) on a **multimodal driver monitoring system (facial video and ECG)**. (Published in *IEEE TITS*, 60+ citations).

- **Vision research at National Cheng Kung University (NCKU) and Academia Sinica:**

Conducted research on **trajectory clustering** and **superpixel**. (Published in *IEEE TIP; IEEE ICIP*)

## Publications

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12 peer-reviewed (**140+ citations**): **4 first-author journals** (2 Top 10%, 1 Top 25%), **4 first-author conferences** (2 oral), 3 co-author journals (2 Top 10%, 1 Top 25%), and 1 co-author workshop.

[Source-free model transferability assessment for smart surveillance via randomly initialized networks](#)

*Sensors*, 2025 (journal, **first-author**)

[Embedding-based pair generation for contrastive representation learning in audio-visual surveillance data](#)

*Frontiers in Robotics and AI*, 2025 (journal, **first-author**)

[Privacy-preserving visual analysis: Training video obfuscation models without sensitive labels](#)

*Applied Intelligence*, 2024 (journal)

[Selective manipulation of disentangled representations for privacy-aware facial image processing](#)

*4th Workshop on Machine Learning for CyberSecurity at ECML PKDD*, 2022 (workshop)

[An opt-in framework for privacy protection in audio-based applications](#)

*IEEE Pervasive Computing*, 2022 (journal, **first-author**)

[Driver monitoring using sparse representation with part-based temporal face descriptors](#)

*IEEE Transactions on Intelligent Transportation Systems (TITS)*, 2020 (journal, **60+ citations**)

[Clustering trajectories in heterogeneous representations for video event detection](#)

*IEEE International Conference on Image Processing (ICIP)*, 2018 (conference, **first-author, oral**)

[USEAQ: Ultra-fast superpixel extraction via adaptive sampling from quantized regions](#)

*IEEE Transactions on Image Processing (TIP)*, 2018 (journal)

[Event based surveillance video synopsis using trajectory kinematics descriptors](#)

*IAPR International Conference on Machine Vision Applications (MVA)*, 2017 (conference, **first-author**)

[Spatiotemporal coherence-based annotation placement for surveillance videos](#)

*IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)*, 2016 (journal, **first-author**)

[Video gender recognition using temporal coherent face descriptor](#)

*IEEE/ACIS SNPD*, 2015 (conference, **first author**)

[Trajectory kinematics descriptor for trajectory clustering in surveillance videos](#)

*International Symposium on Circuits and Systems (ISCAS)*, 2015 (conference, **first-author, oral**)

## Education

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**Ph.D.** in Computer Science Engineering, Ghent University, Belgium (*Sep 2019 - Nov 2025*)

**Master** of Science in Computer and Communication Engineering, NCKU, Taiwan (*Sep 2014 - Jun 2016*)

**Bachelor** of Science in Electrical Engineering, NCKU, Taiwan (*Sep 2010 - Jun 2014*)