Wei-Cheng Wang, Ph.D.

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Summary

Ph.D. in Computer Science Engineering with expertise in **multimodal representation learning**, **generative models**, and **privacy-preserving ML**. Experienced across the **full ML lifecycle**, from raw data collection and curation to prototyping and cross-functional stakeholder pitching. Proven track record of designing **data-centric**, **model-agnostic** mechanisms to tackle **data scarcity**, **domain shifts**, and **privacy constraints**.

Skills

- **Domain Expertise:** Multimodal ML (Audio/Video), Self-Supervised Learning, Contrastive Learning, Privacy-Preserving AI, Real-World Robustness, Transfer Learning.
- **Tech Stack:** Python/C++, PyTorch/TensorFlow, W&B/TensorBoard, Docker, Git, GPULab, AWS.

Experience

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

PyTorch, TensorFlow, Weights&Biases, GPULab, Git

Video/Audio Processing, SSL, Contrastive/Adversarial Learning, Generative Modeling, Domain Adaptation, Anomaly Detection, Privacy-preserving AI, Real-world Deployment & Benchmarking, Mentorship

- **Large-scale ML Evaluation & Real-world Robustness:**

  Architected a context-aware, **model-agnostic** system in collaboration with an **industry partner** for acoustic surveillance. Evaluated the robustness of SOTA **anomaly detection** and **sound classification** against domain shifts with **5000+ hours** of **uncurated real-world audio**. The **edge-to-cloud solution** reduced downstream cloud processing workloads by 90%, ensuring robust deployment.

- **Multimodal Representation Learning:**

  Resolved **false negatives** in **unlabeled streaming data** and improved **representation generalizability** for resource-efficient deployment. Developed an **embedding-based mechanism** for **self-supervised contrastive learning**. Achieved ~10% performance gain while **reducing** edge **deployment costs** through a single general-purpose representation model. (Published in *Frontiers in Robotics and AI*)

- **Privacy-Preserving AI:**

  Architected a **plug-in framework** to **prevent privacy attack** while providing **frictionless integration** with existing ML pipelines. Designed an opt-in mechanism to actively suppress sensitive attributes with **adversarial learning** and **generative-based models**. Neutralized unauthorized attribute extraction to **near-random** while preserving downstream utility, completely **bypassing retraining costs**. (Published in *IEEE Pervasive Computing* and *Applied Intelligence*)

- **Model Assessment:**

  Devised a **task-agnostic** assessment for model selection prior to deployment or fine-tuning. Utilized **RINNs** and **embedding similarity metrics** to identify the informative model without accessing source data. Predicted real-world performance on par with fully supervised baselines while complying with GDPR, enabling data-sovereign model selection for **transfer learning**. (Published in *Sensors*)

- **Mentorship:**

  Co-advised a **master**'s thesis by guiding research directions, SOTA model evaluation, and case analysis.

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

PyTorch, Scikit-learn, Matplotlib

Textual Data, Computer Vision, Machine Learning, Data Acquisition, Technical Communication, Mentorship

- **Industrial Collaboration**: Co-designed lecture and project for 60+ students in a collaboration with **Sony Depthsensing Solutions**. Translated industrial scripts and hardware capabilities into structured project scopes, guiding teams from sensor data acquisition to the delivery of gesture recognition PoCs.
- **Mentorship**: Co-directed practical lab sessions and co-designed projects for 120+ students across two semesters. Guided cross-functional teams to formulate real-world ML use cases using **textual** and **image data**, resulting in analytical solutions for Airbnb **fraud detection** and Tripadvisor **market strategy**.

Co-President & Editor | UGent TSA / Taiwan Science and Technology Division, *Sep 2020 - Aug 2022*

Technical Communication, Leadership

- **Contributing Editor** (Taiwan Science and Technology Division)**:**
  Analyzed key technology and policy developments within the European Union, translating complex technical frameworks into concise strategic briefing reports for government and enterprise stakeholders.
- **Co-President** (Taiwanese Student Association)**:**
  Served as the primary liaison between the expatriate community (100+ members across 3 years) and government during the pandemic. Coordinated **cross-org** resources, strengthening incident-response **coordination**, cross-cultural **communication**, and prioritization under uncertainty.

Research Assistant (pre-PhD) | NCKU / Academia Sinica, *Sep 2014 - Jun 2016, Sep 2017 - Jul 2019*

C++, Tensorflow, OpenCV, MATLAB
Facial Analysis, Video Synopsis, Modal Fusion, Outlier Detection, Tech Commercialization

- **Intelligent Surveillance Systems:** Co-developed a video synopsis system to assist police departments in identifying events and tracking suspects. **Engineered prototype**, **pitched** business model and won international startup competitions (InnoServe 1st, APICTA Top 3); successfully facilitating **tech transfer.**
- **Outlier Detection:** Designed an unsupervised CNN-based **outlier detection** framework with **stage-wise learning** and custom loss function, achieving SOTA performance on multiple benchmarks.
- **Driver Monitoring:** Co-developed a **facial-ECG** monitoring pipeline with national partner ARTC to enhance active road safety. Executed the **end-to-end development lifecycle**, spanning hardware sensor integration, raw data preprocessing, and predictive algorithm prototyping. Delivered a robust solution that won 2nd place globally in a startup competition. (Published in *IEEE TITS*)

Selected Projects

Agentic AI System | Self-initiated, *Dec 2025 - April 2026*

Python, AWS (ECS, S3), Docker, LLM APIs, ChromaDB
Agentic Workflows, Parallel Processing, AI Orchestration, Mixture-of-Agents, RAG

- Designed a multi-phase multi-agent orchestration pipeline using Python and Docker, and cloud-based parallel processing via AWS. Features a hybrid LLM gateway, **ChromaDB-backed** semantic indexing, and HDBSCAN clustering for ROI-based prioritization. Enforced structured data contracts via **Pydantic** and utilized **AWS S3** for artifact storage, optimizing **API quota consumptio**n and end-to-end system latency.

Master's Thesis Research | NCKU, *Sep 2015 - Jun 2016*

Spatiotemporal Optimization, Markov-Random Field

- Optimized UI readability for analytic results in smart surveillance. Formulated annotation placement as spatiotemporal optimization problem and solved via **MRF-based energy minimization**. Mitigated visual jittering and label occlusion to **prevent cognitive fatigue** during post-analysis. (Published in *IEEE TCSVT*)

Full Portfolio & PhD Research Details: Personal Website

Selected Publications

12 publications (140 citations); 7 journals with 3 Top 10% (*IEEE TIP*, *TITS*, *TCSVT*) and 3 Top 25% (Scopus)

Embedding-based pair generation for contrastive representation learning in audio-visual surveillance data
Frontiers in Robotics and AI, 2025. (First author)

Source-free model transferability assessment for smart surveillance via randomly initialized networks
Sensors, 2025. (First author)

Privacy-preserving visual analysis: Training video obfuscation models without sensitive labels
Applied Intelligence, 2024. (Second author)

An opt-in framework for privacy protection in audio-based applications
IEEE Pervasive Computing, 2022. (First author)

For a complete list of publications, see: Google Scholar

Education

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*)