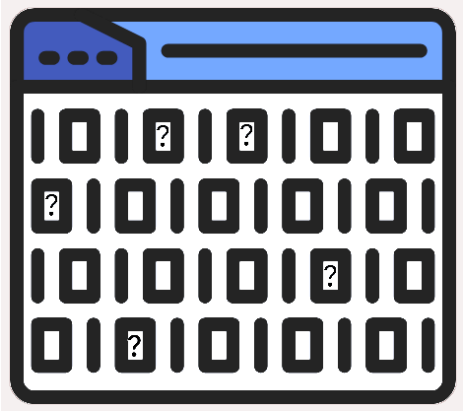
Project: Imputing Missing Data by Modelling and Solving the MCC Problem

Authors: Boukria Ali, Farouk Toumani.

Introduction to the Poster

- Poster presents approach to **Most Compliant Class (MCC)** problem querying datasets with missing data.
- MCC modelled as minimum cost flow with convex costs and integer flows.
- Analyzes cutting-edge methods: approximation polynomial algorithms, SCIP branch-and-bound.
- Applications: missingness graphs, possible worlds probabilities, compliant class selection
- Summarizes theory, solvers, and optimization challenges



Network-based Intrusion Detection Systems Using Machine Learning

Florent Durécu

Thesis Focus :

- Evaluation methods for Network-based Intrusion Detection Systems (NIDS).
- Reviewing frameworks applicability.

Current Works :

- Explainability of Machine Learning in NIDS.
- Smart sampling of network flows to manage the network evolution.

Deep Learning on SWIR Images for Road Perception in Harsh Weather

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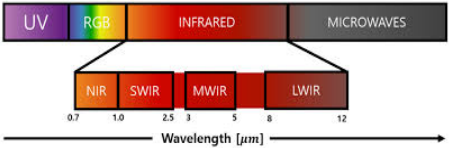
Introduction

RGB cameras **fail** in adverse weather. SWIR (0.9–1.7 µm) offers:

- Penetrates fog & rain
- Robust to glare & overexposure.
- Contrast on snow.
- Reveals material reflection.

Dataset: RASMD

Image pairs	**100,000**
RGB sensor	FLIR GS3
SWIR sensor	CREVIS HG



Source: H. Song et. al., Applied Science, 2024

Detection & Domain Adapt.

Models:

YOLOv8x — CNN single-stage

RF-DETR — Transformer-based

Fine-tuning strategies:

- Pre-trained (no fine-tune)
- RGB-only fine-tune
- SWIR-only fine-tune
- Mix RGB+SWIR (50/50)
- Synthetic Aug. (Real + 20% Fake)
- Weather-specialist

SWIR Advantage: Use-Case Analysis

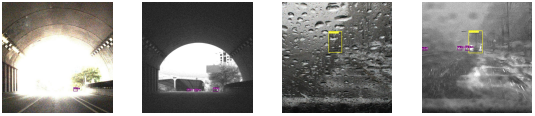
Segregation: 3 methods assign 100k frames to RGB-Better / SWIR-Better / Equal / Discarded (can't decide).

• **M1** Any-Vote • **M2** Majority • **M3** Unanimous

Images humanly verified and classified into 4 buckets

Condition	Recall ↑		F1 ↑	
	RGB	SWIR	RGB	SWIR
Hidden	0.763	**0.806**	0.833	**0.864**
Very-Far	0.729	**0.789**	0.811	**0.852**
Glare	0.332	**0.720**	0.475	**0.808**
Water-Win	0.646	**0.800**	0.747	**0.864**

Glare (tunnel exit) **Water-Window** (rain/snow)



RGB SWIR RGB SWIR

Conclusions

- SWIR **complements** RGB.
- **RF-DETR** outperforms YOLOv8.
- **Synthetic SWIR** viable.
- SWIR advantage is **recall-driven**.

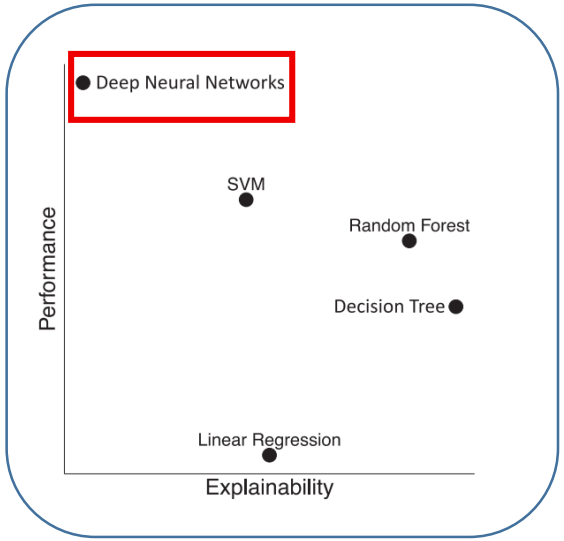
Future Work

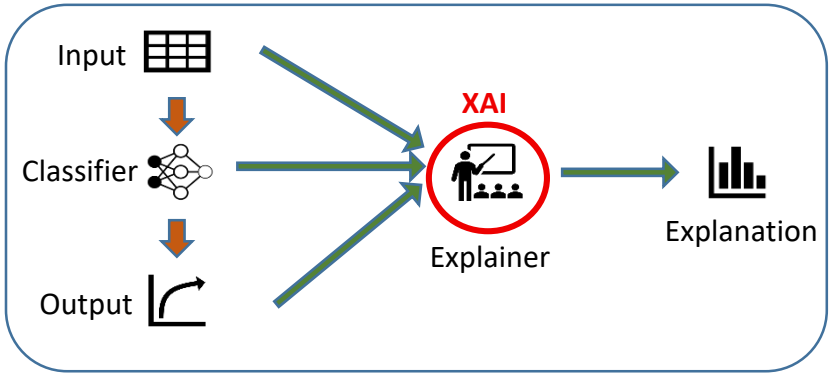
- RGB–SWIR **sensor fusion** using Dynamic modality weighting.

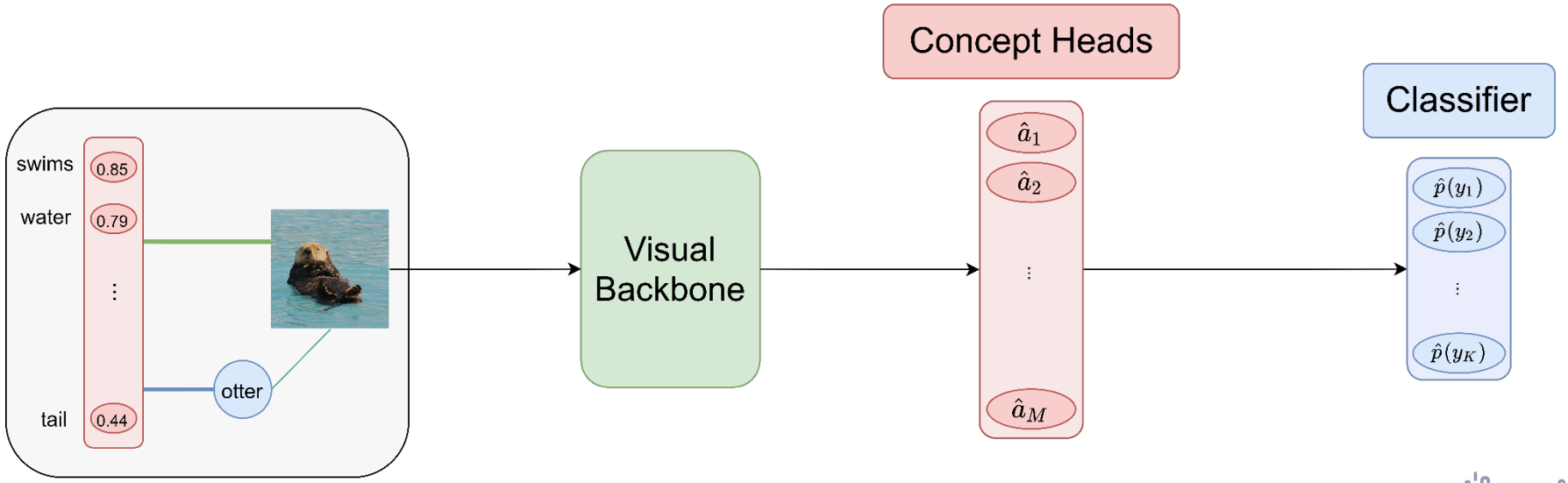
Concept-Based Explainability for Deep Neural Networks

Rim El Cheikh

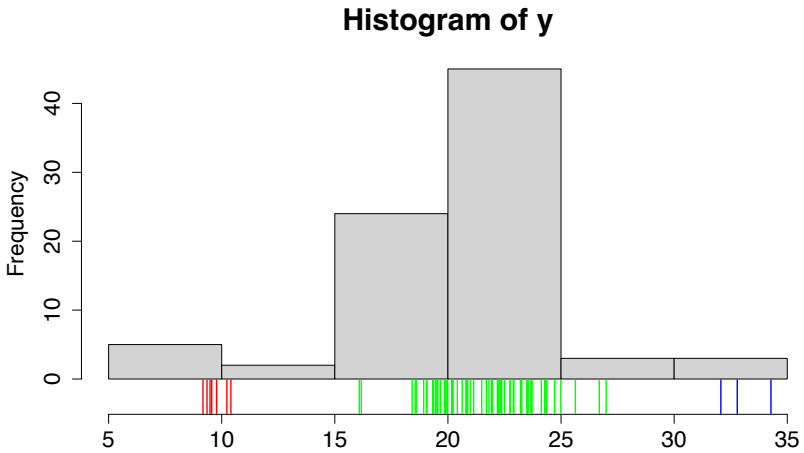
Director : Engelbert Mephu Nguifo
Co-supervisor : Issam Falih

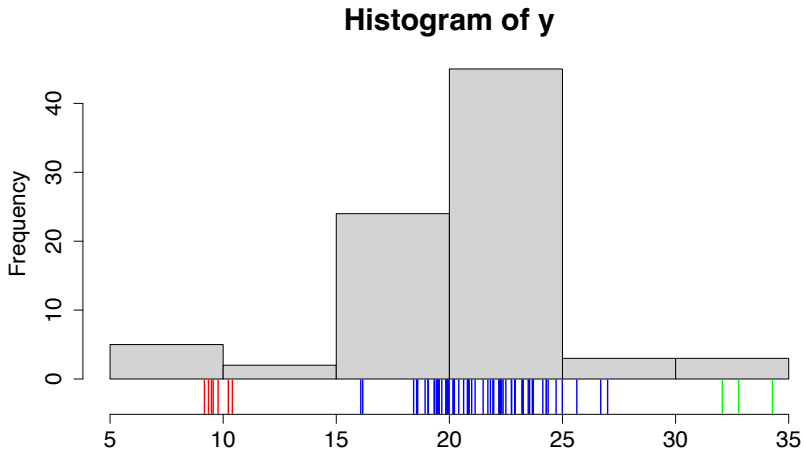






Marginal Likelihood Estimation for Mixture Models





Goal

Bayesian model selection

Problem

Label switching

Solution — THAMES

- Truncated Harmonic Mean Estimator
- R package : **thamesmix**
- Input : MCMC sample + prior + likelihood

Properties

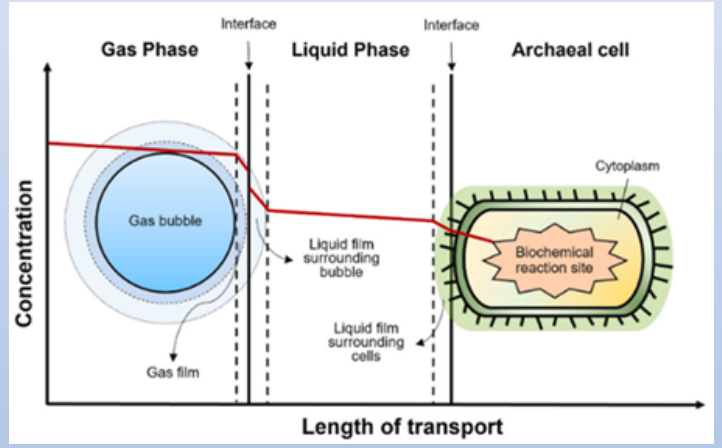
- Unbiased, asymptotically normal
- Generic (any mixture model)
- Fast, simple, symmetric

Joint work : Metodiev, Irons, Perrot-Dockès, Latouche, Raftery

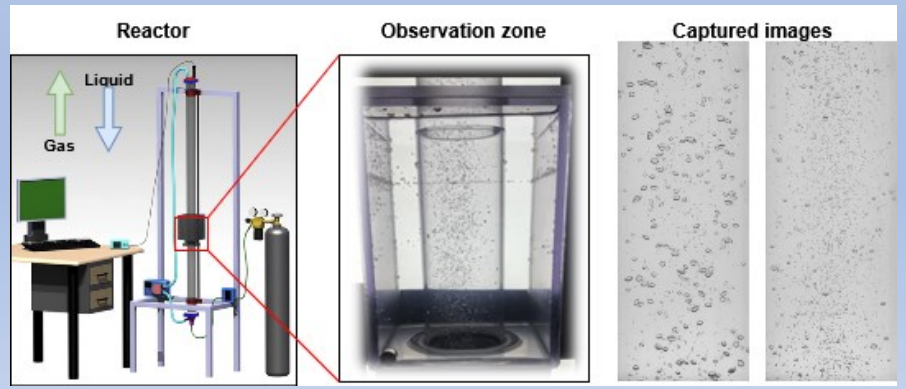
Exploring Bubble Flow with Deep Learning: A Preliminary Study

Trong Nghia NGO – 2nd year - PhD student – Institut pascal/UCA

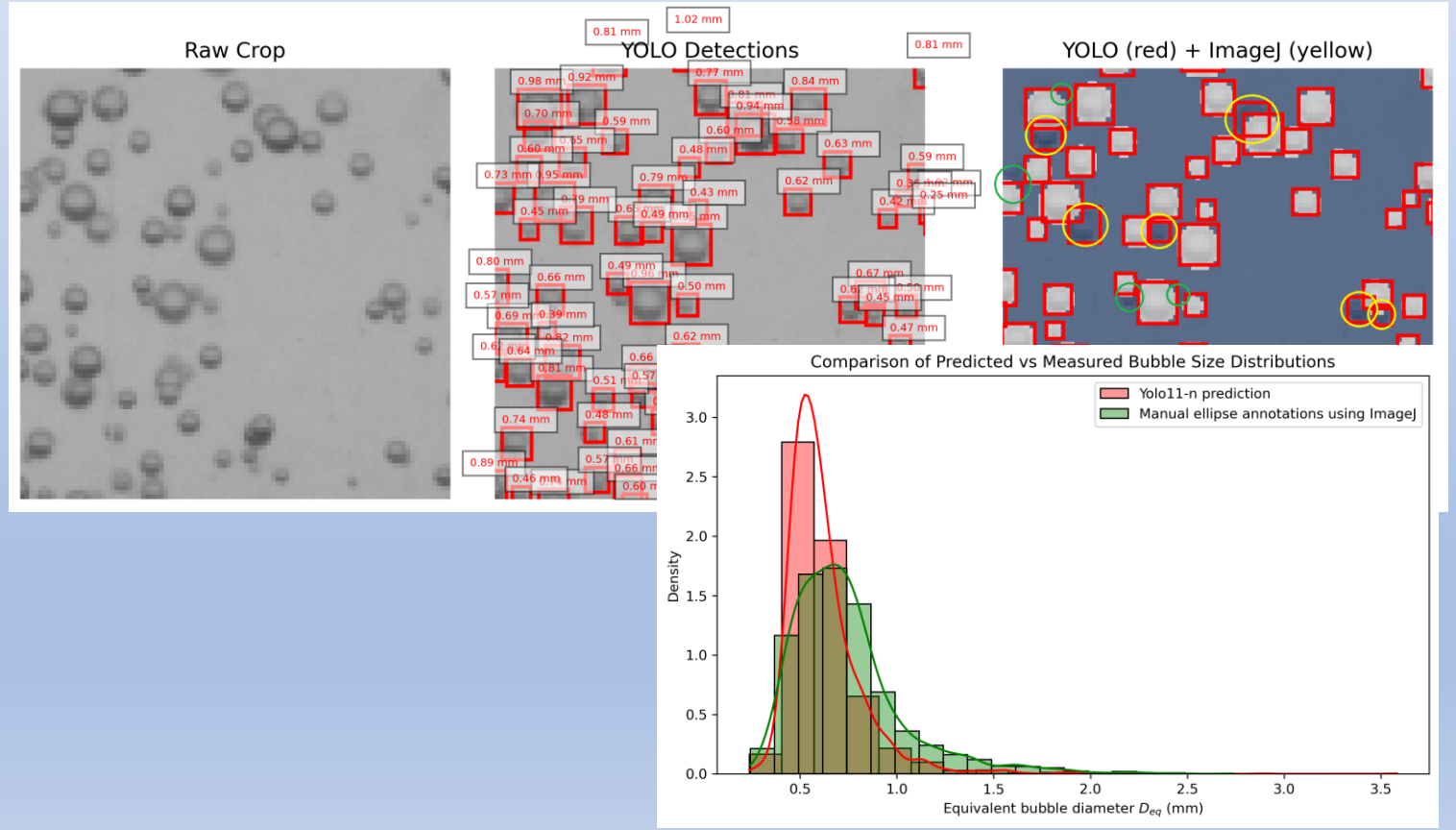
- Resistance of gas-liquid transfer

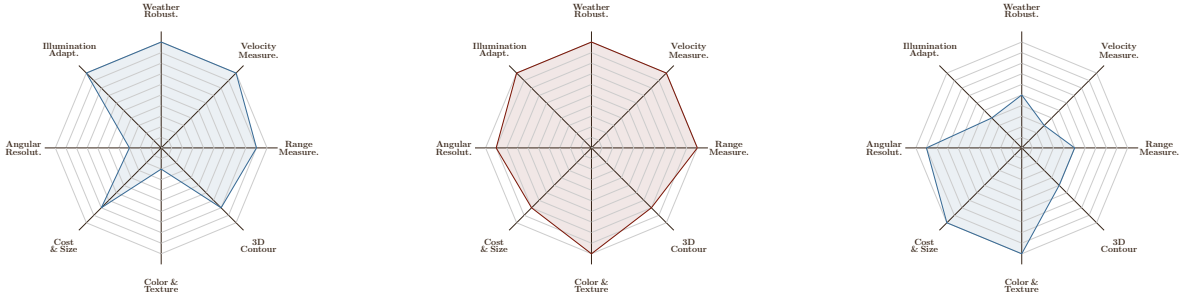


- Lab-scale reactor



- Results





(a) Radar (b) Radar + Camera (c) Camera

Figure 1 – Radar and Camera Sensors Complementarity

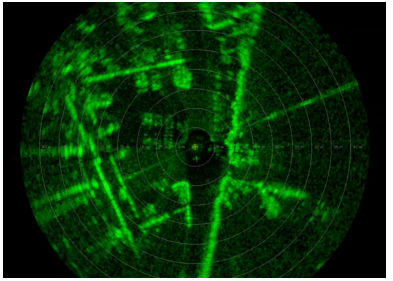


Figure 2 – Radar Scan Spectrum

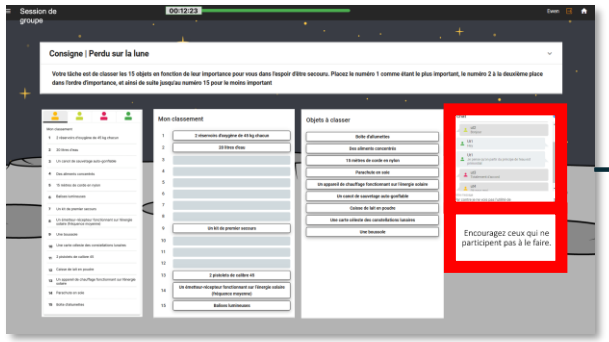
Figure 3 – Camera Image

Reinforcement Learning for Real-Time Feedback to Optimize Group Dynamics

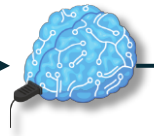
Zineddine ZAHOUANI, Farouk TOUMANI, Marinette BOUET

Methodology:

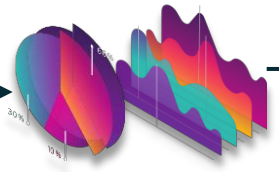
1. Capturing real-time user interactions
2. Predicting behaviors using AI-based solutions
3. Providing timely & precise feedback via RL

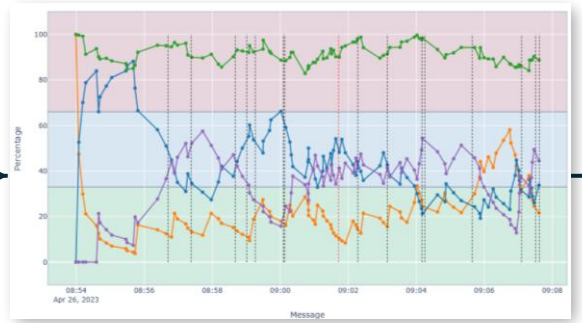


Messages



Logs





Group Dynamics

RL Agent

Feedback Messages

- *Encouragez ceux qui ne participent pas à le faire.*
- *Méfiez-vous d'un accord trop rapide*
- *Vous pouvez critiquer les idées, mais ne critiquez jamais les personnes.*

Real – Time Feedback Message

ecc'ipe

Early-Career Researchers' Day of the DATA Programme I-SITE CAP 20-25

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