Antonio Martínez Ibarra
antonio.martinezi@um.es

Ph.D student in Computer Science,
University of Murcia

CLOUD STARS

AI for Smart Environments and Dimensionality Reduction

Funded by the European Union

Index

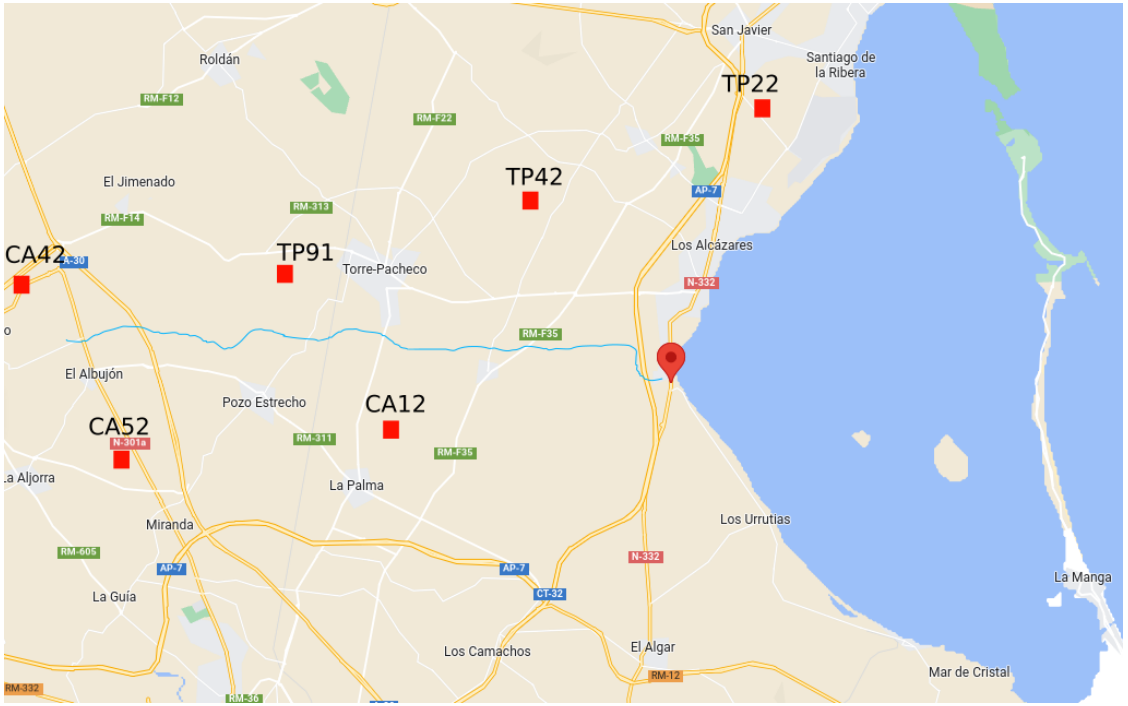
1. Marine Sciences
2. Smart Agriculture
3. Energy Efficiency
4. Time Series Classification
5. Future Work

Index

1. Marine Sciences
2. Smart Agriculture
3. Energy Efficiency
4. Time Series Classification
5. Future Work

Water level forecast

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias

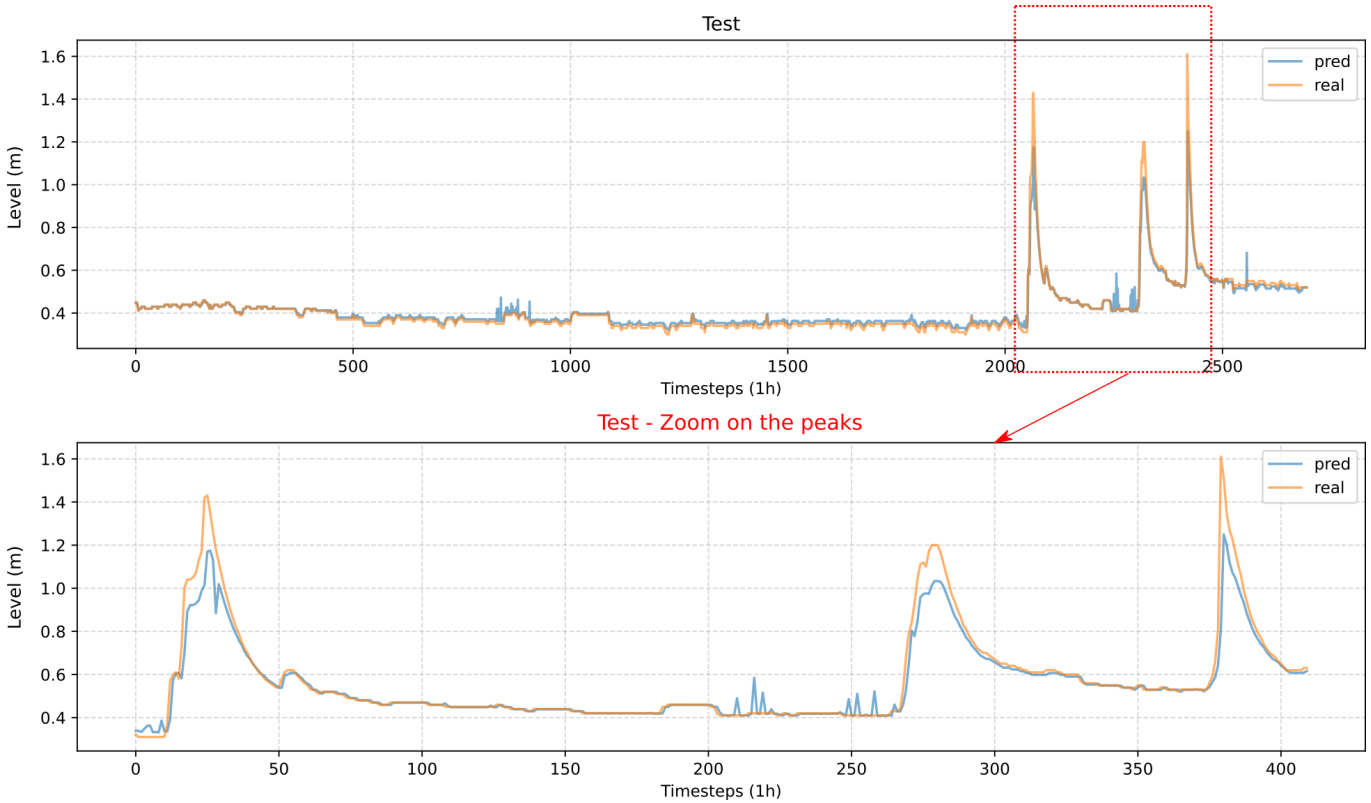


Area of study

- Water flow from stream to Mar Menor
- Multiple data sources during its course

Water level forecast

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias



1 hour forecast

- Time Series forecast
- Deep learning models (focus on LSTM)

Index

1 Marine Sciences

2 Smart Agriculture

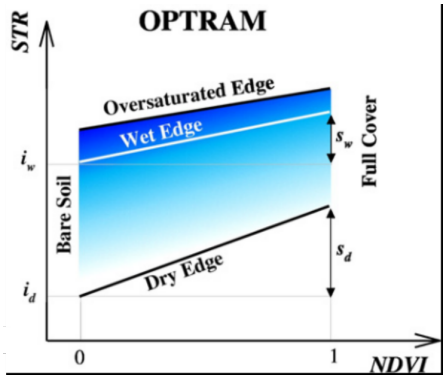
3 Energy Efficiency

4 Time Series Classification

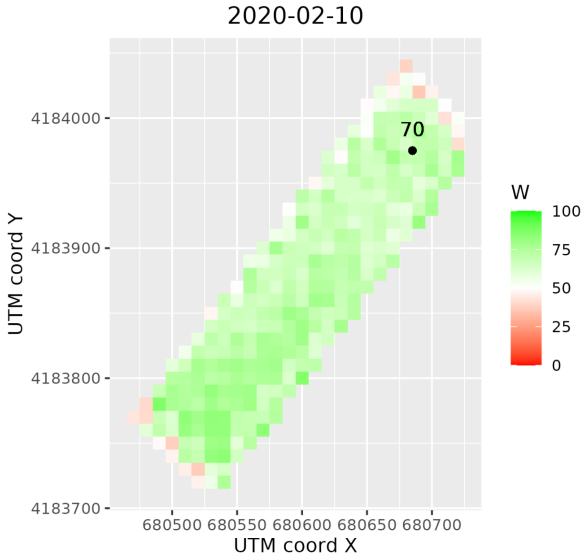
5 Future Work

OPTRAM

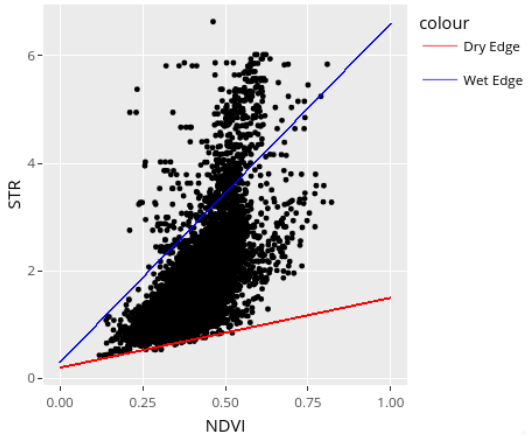
Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias



STR-NDVI space [1]



Output result

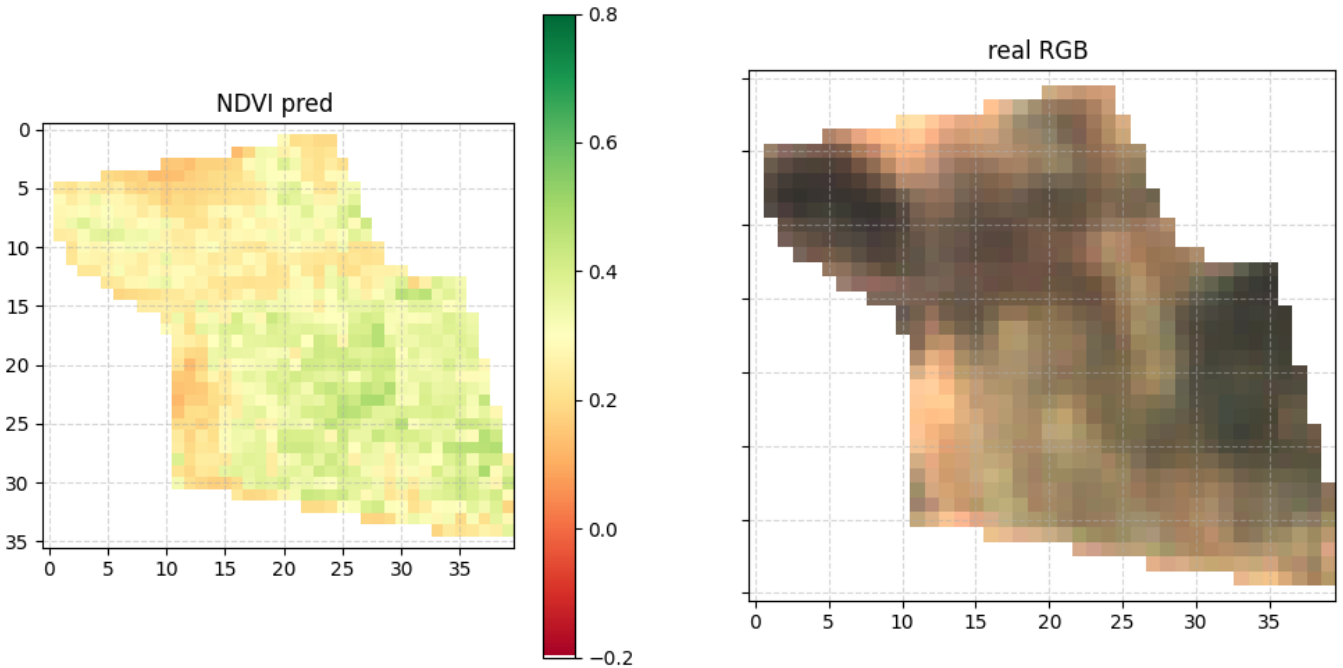


STR-NDVI in real scenario

- i_d,i_w, s_d, s_w automatically computed
- Model returns base64 image

RGB-NDVI

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias

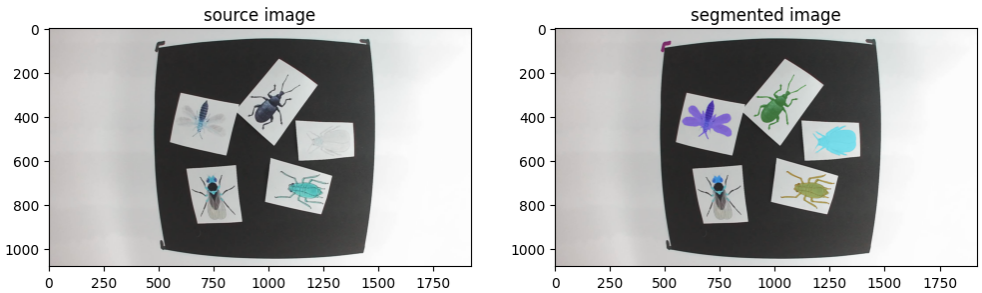


Predicted image and satellite image

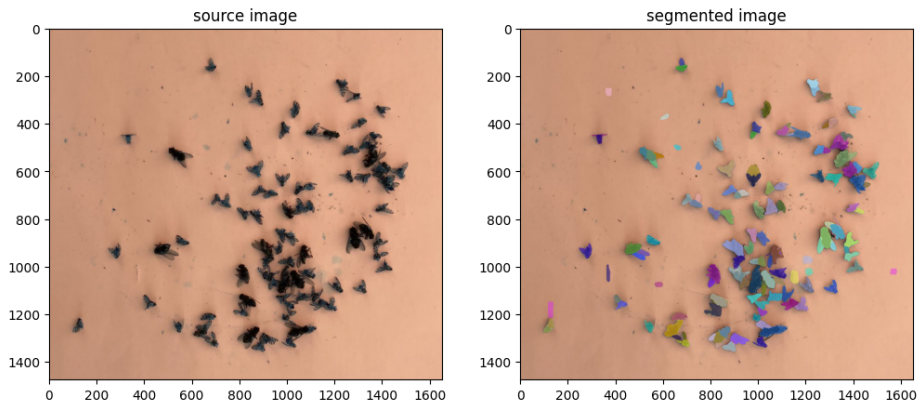
- NDVI: overall health status
- Cross validation, model selection and hyperparameter optimization
- Best one: Random Forest Regressor

Autolabelling

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias



Detection in staged scenario



Detection in real scenario

- Segment Anything Model [2]

Index

1 Marine Sciences

2 Smart Agriculture

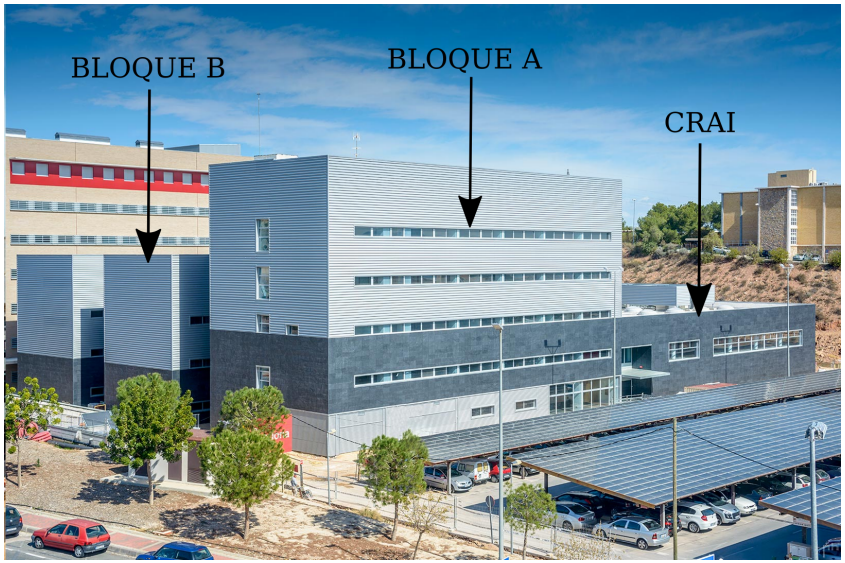
3 Energy Efficiency

4 Time Series Classification

5 Future Work

Temperature and consumption forecasts

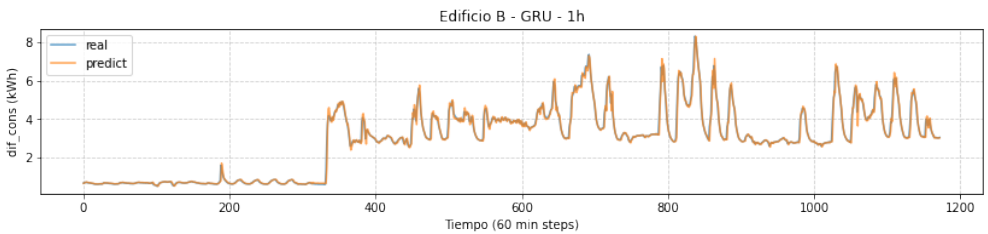
Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias



Use case building [3, 4]

- Consumption
- Temperature
- HVAC data
- Meteorological data

- Data Descriptor [5]



Consumption forecast for block B

Temperature and consumption forecasts

Marine Sciences

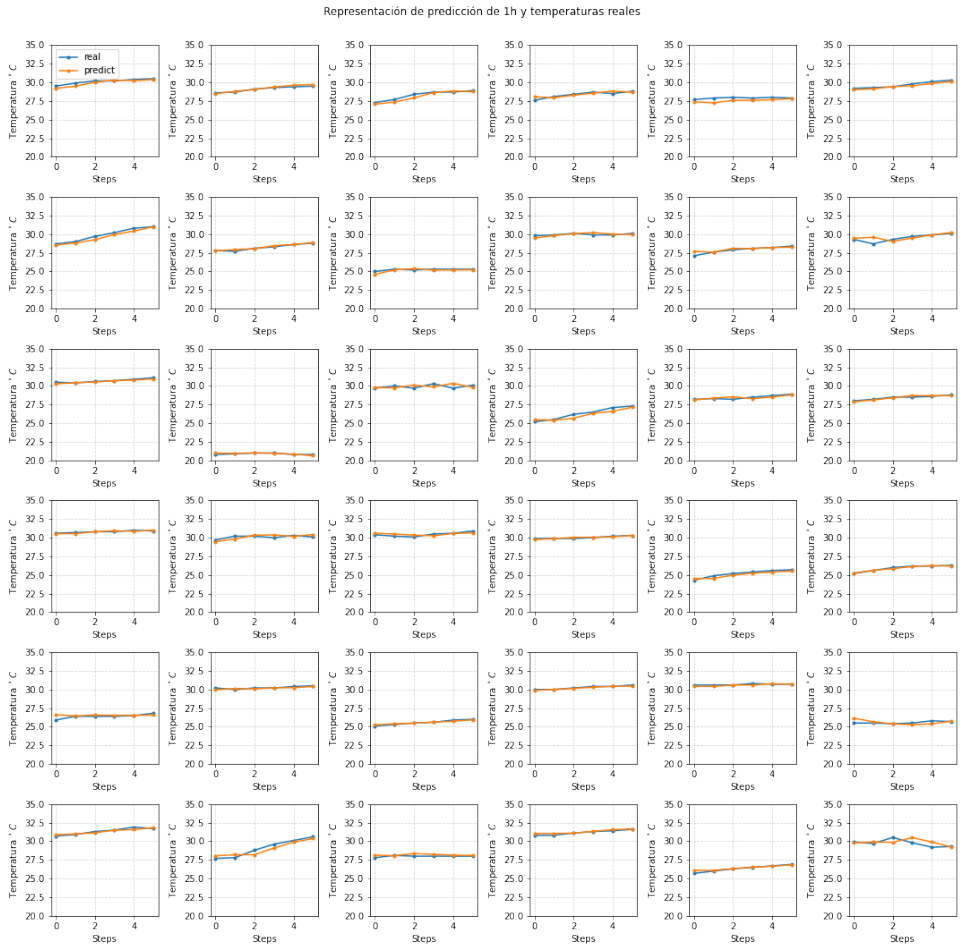
Smart Agriculture

Energy Efficiency

Time Series Classification

Future Work

Referencias



Temperature forecast for each room

Index

1 Marine Sciences

2 Smart Agriculture

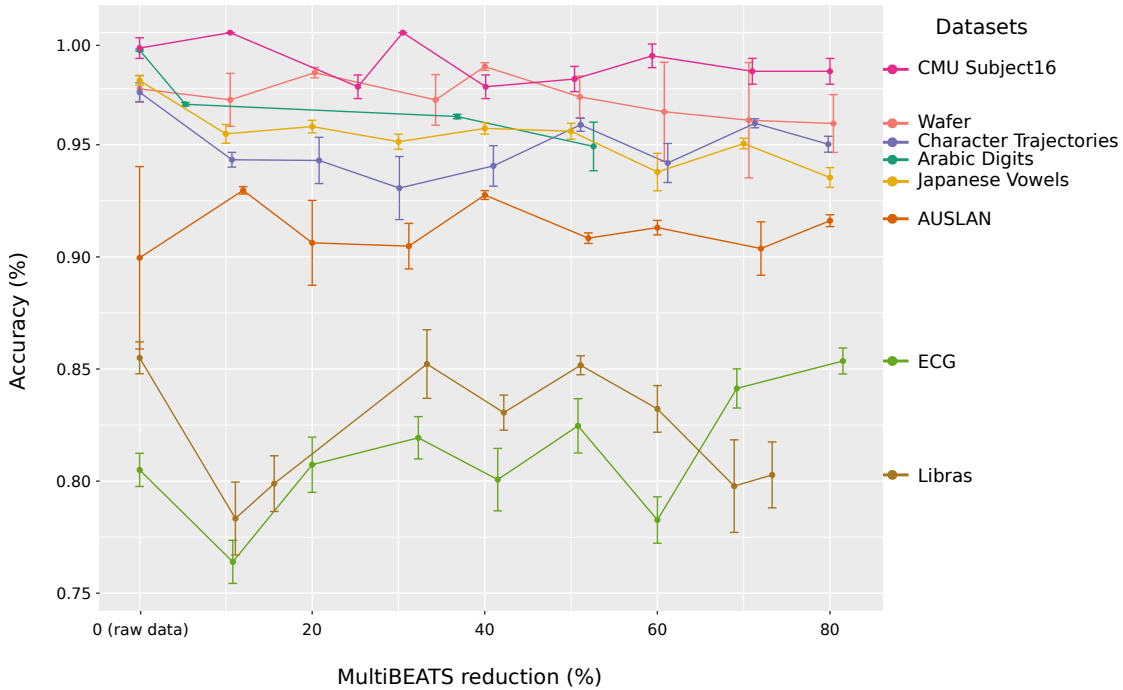
3 Energy Efficiency

4 Time Series Classification

5 Future Work

multiBEATS

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias



Evolution of accuracy compared to MultiBEATS reduction percentages [6]

- Dimensionality reduction [7]
- Maintain or improve raw accuracy

Index

1 Marine Sciences

2 Smart Agriculture

3 Energy Efficiency

4 Time Series Classification

5 Future Work

GPUs monitoring

Marine Sciences
Smart Agriculture
Energy Efficiency
Time Series Classification
Future Work
Referencias

- Model inference
- Inference time and memory usage
- Real images
- Test different architectures (EfficientNet, DenseNet, VGG, etc)
- Concurrency
- Optimization model

References I

Marine Sciences

Smart Agriculture

Energy Efficiency

Time Series Classification

Future Work

Referencias

[1] Morteza Sadeghi et al. "The optical trapezoid model: A novel approach to remote sensing of soil moisture applied to Sentinel-2 and Landsat-8 observations". En: *Remote sensing of environment* 198 (2017), págs. 52-68.

[2] Alexander Kirillov et al. "Segment anything". En: *arXiv preprint arXiv:2304.02643* (2023).

[3] *Adapt-&-Play Holistic cOst-Effective and user-frieNdly Innovations with high replicability to upgrade smartness of eXisting buildings with legacy equipment*. 2021. URL: https://cordis.europa.eu/project/id/893079/es.

[4] Antonio Skarmeta. *First feedback from the Proof-of-Concept deployment and Introduction to the other pilots*. 2020. URL: https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5df32915d&appId=PPGMS.

[5] Antonio Martínez Ibarra, Aurora González-Vidal y Antonio Skarmeta. "PLEIAData: consumption, HVAC, temperature, weather and motion sensor data for smart buildings applications". En: *Scientific Data* 10.1 (2023), pág. 118.

[6] Aurora González-Vidal, Antonio Martinez-Ibarra y Antonio F Skarmeta. "MultiBEATS: Blocks of eigenvalues algorithm for multivariate time series dimensionality reduction". En: *Information Fusion* (2023), pág. 102159.

[7] Aurora Gonzalez-Vidal, Payam Barnaghi y Antonio F Skarmeta. "Beats: Blocks of eigenvalues algorithm for time series segmentation". En: *IEEE Transactions on Knowledge and Data Engineering* 30.11 (2018), págs. 2051-2064.

Antonio Martínez Ibarra
antonio.martinezi@um.es

Ph.D student in Computer Science,
University of Murcia

CLOUD STARS

AI for Smart Environments and Dimensionality Reduction

Funded by the European Union