Gustavo A. Olivares Pino

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Summary

Air quality scientist with more than 18 years of experience innovating in instrument design, data management, scientific computing and citizen science.

Work Experience

Air Quality Scientist at NIWA Jan 2007 - present

My role at NIWA has been to lead the development of new technologies both in measurements and data analysis and visualisation. I have also been tasked with the data management of our group and with facilitating the participation of non-technical users in our research.

PhD student Feb 2002 - Dec 2006

My work was primarily developing a mobile measurement platform for ultrafine particles as well as studying the processes affecting aerosol behaviour in urban environments.

Projects

Clear the Air Link to more info

The objective of the project was to characterise the ventilation conditions of many indoor spaces in New Zealand. For that purpose, I developed a platform to centrally capture indoor air quality measurements together with context information like state of doors/windows and human presence in the room. I designed and implemented a system based on a Raspberry Pi computer connected through BlueTooth and Zigbee to various sensors. I also implemented the data pipeline and automatic reporting systems using AWS to store data and run R and Python scripts to generate reports.

CONA Link to more info

My main contribution to this project was two-fold. First, I designed and built the Outdoor Dust Information Node (ODIN) with a custom made PCB to integrate the Plantower PMS- series particle sensors and 2G and WiFi telemetry. This device, of which we now have more than 100 units, allowed us to deploy very dense networks at relatively low cost which allowed us to tackle spatial variability in air quality with a resolution not possible before. The second area was around data management and automatic reporting. Here I designed the database and cloud infrastructure to support our measurements and I implemented automatic, container-based, reporting tasks that took the live measurements from ODIN and Clarity networks and turn them into inputs to 3D animation systems and public "instrument health" checks.

TOTUS Link to Demo

TOTUS is a GIS-based environmental impact tool that takes city-scale layers like road network, land use type and building footprint, and allows the implementation of air pollutant emission and exposure, together with energy consumption models. I was the PI in this project and I also co-designed the PostgreSQL-PostGIS database that runs the system.

WEDGE Link to Poster

WEDGE was a measurement campaign in Auckland in 2009. My contribution was designing and building the $MAQS^2$ (Mobile Air Quality Sampling System), a car-mounted system to measure aerosol size distribution, ambient conditions and black carbon. I was responsible for the electrical design, data communication and the development of the LabView system to manage the platform.

Education

2002 - 2006 Fil. Lic. (Applied Environmental Science - Atmospheric Chemistry) at **Stockholm University** (Urban Aerosols)

1999 - 2001 MSc (Chemical Engineering) at **Universidad de Chile** (Regional Dispersion of Oxidized Sulfur in Central Chile)

1992 - 1998 Chemical Engineering at **Universidad de Chile** (Simulation of the Protein Purification using Ion Exchange Chromatography)

Skills

Technical skills	Electronic design, Cloud computing, Scientific programming (R, Python, Octave, SQL), Database design, Version control systems (Git), Linux, Machine learning, Instrument design and control, LabView programming.
Soft skills	Problem solving, Creativity, Data analysis, Experiment design, Curiosity, Team work, Communication.
Languages	Spanish (native), English (fluent), Swedish (basic)

Latest Publications

Chen, Bowen, Yun Sing Koh, Gillian Dobbie, Ocean Wu, Guy Coulson, and Gustavo Olivares (2022). "Online Air Pollution Inference using Concept Recurrence and Transfer Learning". In: *2022 IEEE 9th International Conference on Data Science and Advanced Analytics (DSAA)*. IEEE, pp. 1–10. URL: https://ieeexplore.ieee.org/abstract/document/10032404/ (visited on 04/19/2024).

Halstead, Ben et al. (Oct. 2022). "Analyzing and repairing concept drift adaptation in data stream classification". en. In: *Machine Learning* 111.10, pp. 3489–3523. ISSN: 1573-0565. DOI: 10.1007/s10994-021-05993-w. URL: https://doi.org/10.1007/s10994-021-05993-w (visited on 10/25/2022).

Paton-Walsh, Clare et al. (Jan. 2022). "Key challenges for tropospheric chemistry in the Southern Hemisphere". In: *Elementa: Science of the Anthropocene* 10.1, p. 00050. ISSN: 2325-1026. DOI: 10.1525/elementa.2021.00050. URL: https://doi.org/10.1525/elementa.2021.00050 (visited on 10/25/2022).

Coulson, Guy, Susan Jowsey, Marcus Williams, and Gustavo Olivares (Apr. 2021). "O-Tū-Kapua (What Clouds See): A Mixed Reality Exploration of Atmospheric Science". In: *Leonardo* 54.2, pp. 215–219. ISSN: 0024-094X. DOI: 10.1162/leon_a_01789. URL: https://doi.org/10.1162/leon_a_01789 (visited on 10/25/2022).

Halstead, Ben et al. (Oct. 2021). "Analyzing and Repairing Concept Drift Adaptation in Data Stream Classification". In: *2021 IEEE 8th International Conference on Data Science and Advanced Analytics (DSAA)*, pp. 1–2. DOI: 10.1109/DSAA53316.2021.9564191.

Nathan, Brian et al. (Jan. 2021). *The MAPM (Mapping Air Pollution eMissions) method forinferring particulate matter emissions maps at city-scale from in situconcentration measurements: description and demonstration ofcapability*. en. preprint. Aerosols/Atmospheric Modelling/Troposphere/Physics (physical properties and processes). DOI: 10.5194/acp-2020-1303. URL: https://acp.copernicus.org/preprints/acp-2020-1303/acp-2020-1303.pdf (visited on 10/25/2022).

Pang, Shaoning, Lei Song, Abdolhossein Sarrafzadeh, Guy Coulson, Ian Longley, and Gustavo Olivares (Jan. 2021). "Indoor Emission Sources Detection by Pollutants Interaction Analysis". en. In: *Applied Sciences* 11.16. Number: 16 Publisher: Multidisciplinary Digital Publishing Institute, p. 7542. ISSN:

2076-3417. DOI: 10.3390/app11167542. URL: https://www.mdpi.com/2076-3417/11/16/7542 (visited on 10/25/2022).

Coulson, Guy, Jonathan Moores, et al. (2020). "Toward a Framework for Resilience Assessments: Working Across Cultures, Disciplines, and Scales in Aotearoa/New Zealand". English. In: *Frontiers in Sustainable Cities* 2. Publisher: Frontiers. ISSN: 2624-9634. DOI: 10.3389/frsc.2020.00011. URL: https://www.frontiersin.org/articles/10.3389/frsc.2020.00011/full (visited on 11/26/2020).

Dale, Ethan R. et al. (Oct. 2020). "The winter 2019 air pollution ($PM_{2.5}$) measurement campaign in Christchurch, New Zealand". English. In: *Earth System Science Data Discussions*. Publisher: Copernicus GmbH, pp. 1–29. ISSN: 1866-3508. DOI: https://doi.org/10.5194/essd-2020-276. URL: https://essd.copernicus.org/preprints/essd-2020-276/ (visited on 11/26/2020).

Kremser, Stefanie et al. (May 2020). "Mapping Air Pollution eMissions (MAPM)". In: 22. Conference Name: EGU General Assembly Conference Abstracts, p. 11611. URL: http://adsabs.harvard.edu/abs/2020EGUGA..2211611K (visited on 11/26/2020).

Huggard, Hamish, Yun Sing Koh, Patricia Riddle, and Gustavo Olivares (2019). "Predicting Air Quality from Low-Cost Sensor Measurements". In: *Data Mining*. Ed. by Rafiqul Islam et al. Citation Key Alias: huggardPredictingAirQuality2018. Singapore: Springer Singapore, pp. 94–106. ISBN: 978-981-13-6661-1.

Longley, Ian, Brett Tunno, et al. (2019). "Assessment of Spatial Variability across Multiple Pollutants in Auckland, New Zealand". In: *International journal of environmental research and public health* 16.9, p. 1567.

Tunno, Brett et al. (Apr. 2019). "Separating spatial patterns in pollution attributable to woodsmoke and other sources, during daytime and nighttime hours, in Christchurch, New Zealand". en. In: *Environmental Research* 171, pp. 228–238. ISSN: 0013-9351. DOI: 10.1016/j.envres.2019.01.033. URL: http://www.sciencedirect.com/science/article/pii/S0013935118304079 (visited on 11/05/2019).

Wheeler, A et al. (2019). "The use of portable HEPA air cleaners to improve residential indoor air quality during biomass burning events." In: *Environmental Epidemiology* 3, pp. 436–437.

Wheeler, Amanda et al. (Dec. 2019). "Evaluation of portable air cleaners to improve residential indoor air quality during biomass burns". EN. In: *Air Quality and Climate Change* 53.4. Publisher: Clean Air Society of Australia and New Zealand, p. 30. URL: https://search.informit.org/documentSummary;dn=953995199799507;res=IELNZC (visited on 11/26/2020).

Chen, Jiazhen, Gillian Dobbie, Yun Sing Koh, Elizabeth Somervell, and Gustavo Olivares (2018). "Vehicle emission prediction using remote sensing data and machine learning techniques". In: *Proceedings of the 33rd Annual ACM Symposium on Applied Computing*. ACM, pp. 444–451.

Wang, Yu, Julian Jang-Jaccard, et al. (2018a). "Deployment Issues for Integrated Open-Source-ased Indoor Air Quality School Monitoring Box (SKOMOBO)". English. In: *2018 Ieee Sensors Applications Symposium (sas)*. WOS:000462064300045. New York: Ieee, pp. 259–262. ISBN: 978-1-5386-2092-2. URL: https://www.webofscience.com/wos/woscc/full-record/WOS:000462064300045?SID=EUW1ED0CA5iGa11ryGfu8c5HSYuSK (visited on 10/25/2022).

– (2018b). "Deployment issues for integrated open-source—Based indoor air quality school Monitoring Box (SKOMOBO)". In: *2018 IEEE Sensors Applications Symposium (SAS)*. IEEE, pp. 1–4.