

# WP2.2: Reconfigurable Signal Processing

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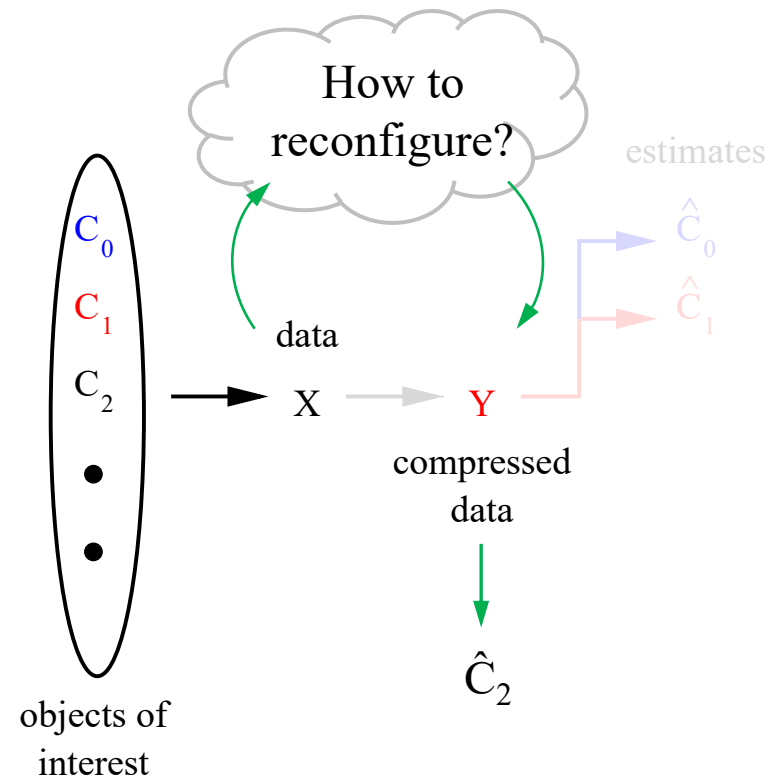
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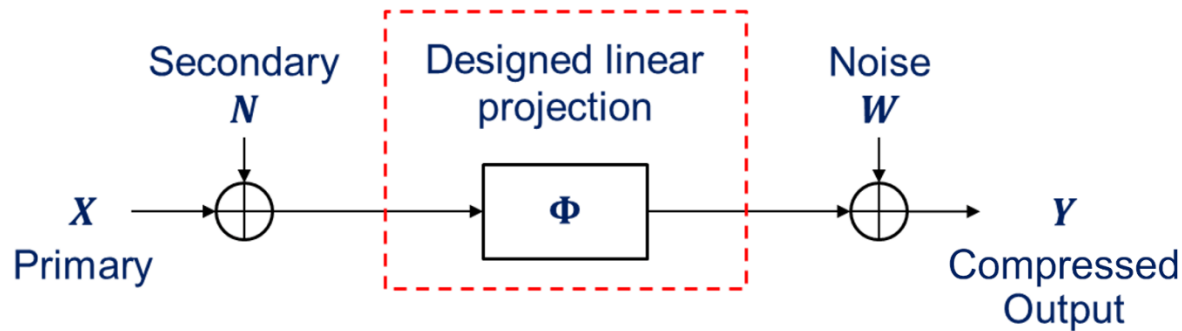
# WP2.2: Reconfigurable Signal Processing

- Signal processing systems routinely dispose of information along the processing chain in the interest of efficiency.
- This “lost” information may be worth recovering.
- Investigate:
  - the fundamental limits of **information recovery**;
  - the active steps that can be put in place to facilitate it.



## WP2.2: Key Research Highlights

- Novel information-theoretic results relating to **control of information flow** when compressing data with multiple sources.
  - Theoretical analysis and experimental results – IEEE Transactions on Signal Processing (responding to reviewers' comments).



- Extension of algorithms to allow for **online learning** of secondary sources – presentation at SSPD 2021 in September.
- Investigation into techniques for low-cost identification of chirp waveforms in joint communications and radar scenarios – poster at SSPD 2021.

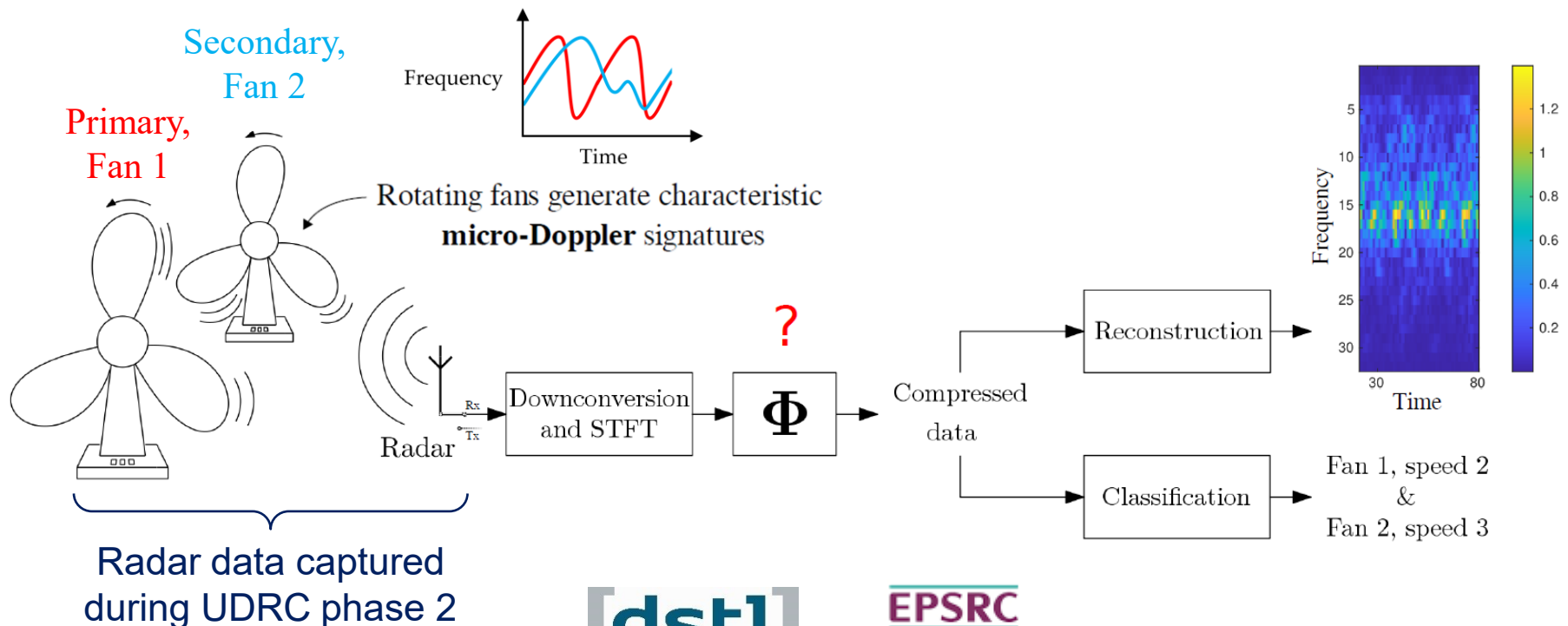
# WP2.2: Key Exploitation Highlights

- Collaborative work package with Leonardo.
  - Funded by Leonardo.
  - 50/50 RA time July-December 2021.
  - Detailed presentation and report.
- Discussion with Dstl in November 2021.
  - Potential sonar datasets and possible collaboration with WP1.3.
  - Identifying and processing secondary sources of information.
- Collaborations with other work packages:
  - John & Fraser – *former UDRC Electromagnetic Environment WP RA*, joint comms-radar IET Signal Processing invited paper submission, January 2022.
  - Fraser – *WP1.3*, IEEE Transactions on Signal Processing submission, February 2022.



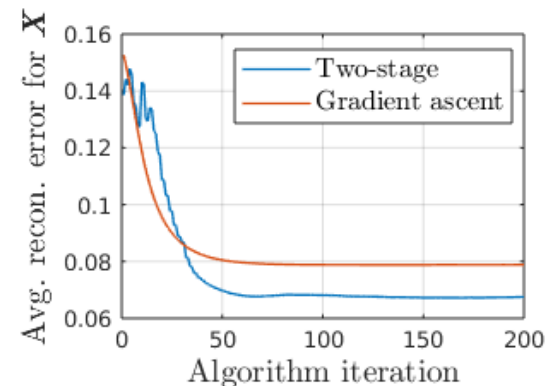
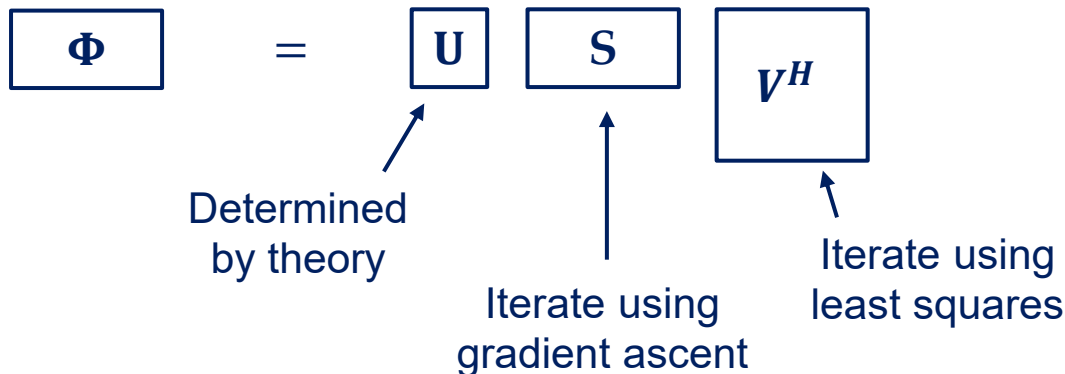
# WP2.2: Key Contributions

- Information-theoretic algorithms for compressive projection design in scenarios where non-Gaussian input experiences non-Gaussian noise prior to its detection.
- Can prioritise signal reconstruction and/or classification of multiple inputs.
- Adaptive extension facilitates online learning of changing secondary source.



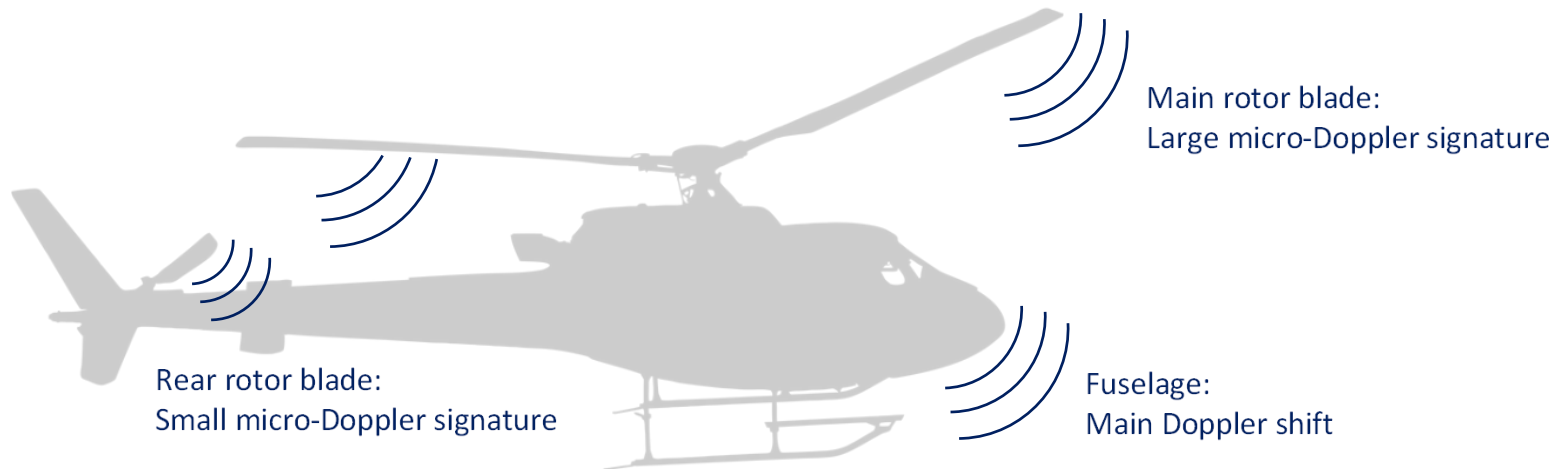
# WP2.2: Recent Research Highlights

- Learning secondary sources from compressive measurements using low rank Gaussian mixture models.
  - Lower computational cost during source learning.
  - Lower computational cost during subsequent projection design.
- Two-stage compressive measurement design achieves convergence to recently uncovered ideal theoretical result in fewer iterations.
  - Components of linear projection matrix are iteratively updated.



## WP2.2: Current and Future Work

- Fully online training of source parameters and compressions strategies for reconfigurable signal processing.
- Discussions with WP2.2 EPoCs: application of existing algorithms to Dstl datasets.
  - e.g., tail rotor blades assist with helicopter classification via micro-Doppler recognition.



- Potential SSPD 2022 contributions:
  - LFM radar parameter estimation for dual comms-radar waveforms.
  - Low complexity projection design exploiting low rank models and two-stage approach.