Research Reproducibility in Control and Systems Engineering

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Systems Engineering and Reproducible Research

Three questions about reproducible research:

- Within systems engineering, what is the level of awareness, interest, concern, and involvement in reproducibility and replicability (R&R) of research results?

- Are there specific areas within systems engineering that are more likely to have issues with reproducing scientific results?

- What reproducibility challenges does systems engineering face with cross disciplinary research?

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A text for today's briefing:

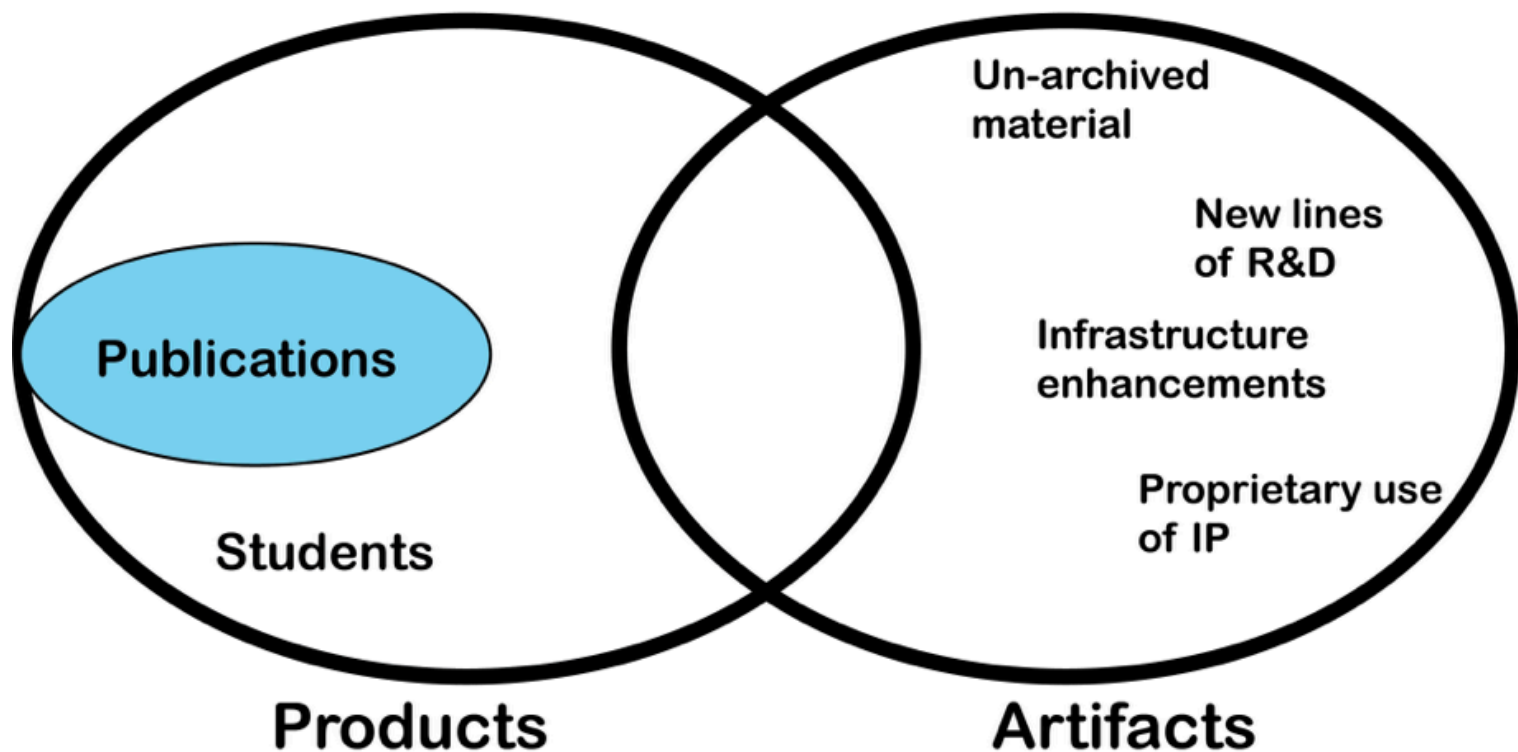http://www.ieee.org/researchreproducibility

Joint work with:

Samir El-Ghazaly, IEEE VP Publications Services and Products (PSPB)
Gianluca Setti, former VP PSPB
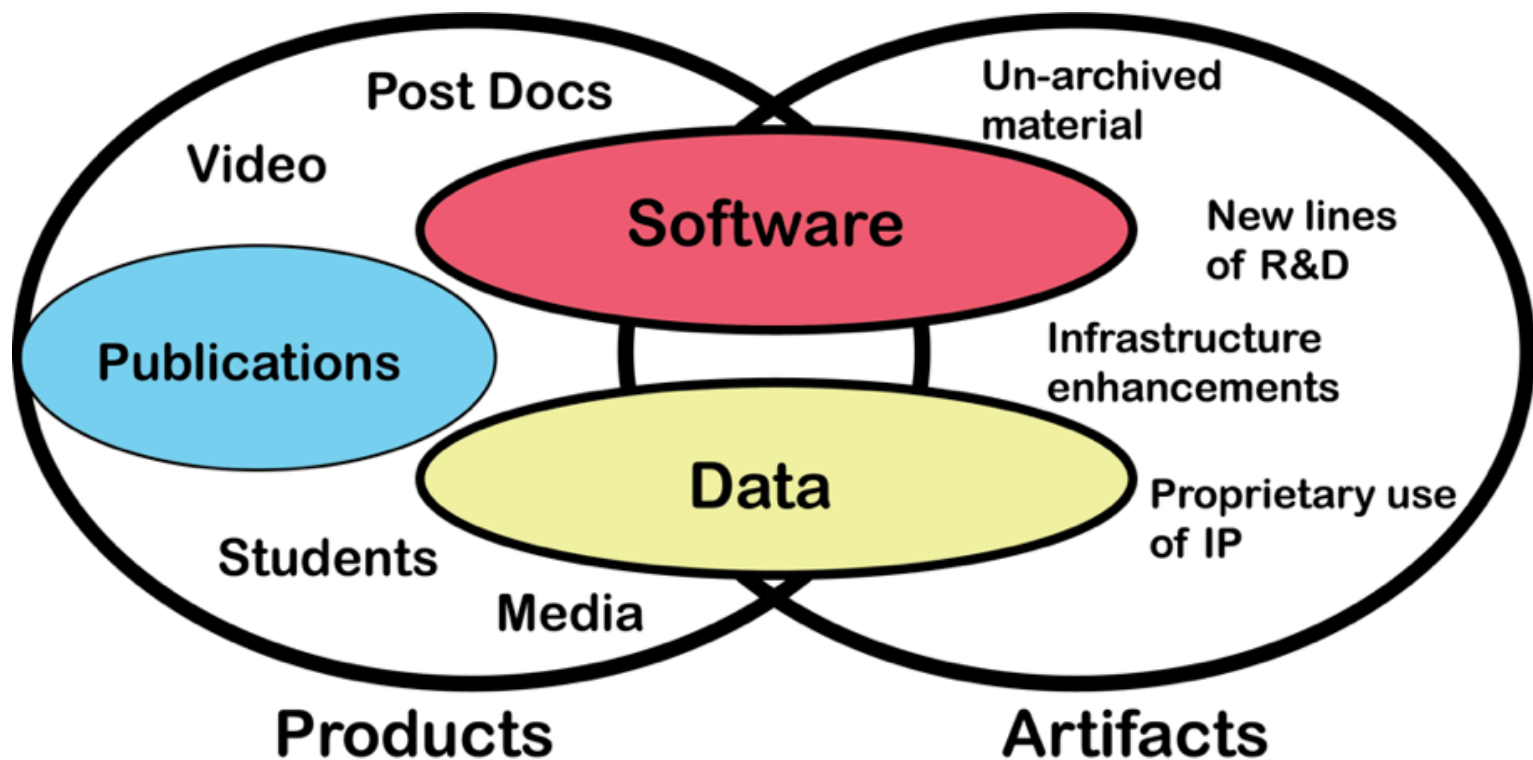Gerry Grenier, IEEE Senior Director, Publishing Technologies

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Research Products — Past and Present

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- Research reproducibility is infrequently discussed in systems and control.

- "It's more relevant in the social sciences than in Engineering." – A former NSF Assistant Director, 2015.

- Historically, most areas of systems and control have not been involved with data, and although research has had significant software components, it has not been a tradition to publish code.

- There may be change in the air.

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- A growing body of research in robotics deals with exploration and data acquisition.

- Network science has come into its own and is increasingly focused on data

- New journals have been launched:

  o   IEEE Transactions on Network Science and Engineering (2014)

  o   IEEE Transactions on Control of Network Systems (2014)

  o   IEEE Transactions on Signal and Information Processing Over Networks (2015).

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- Smart grid and advanced building automation technologies are increasingly data intensive

- The increasing use of standard software libraries (e.g. ROS and OpenCV) provide encouragement for researchers to share code.

- The increasing sharing of code using GitHub and other collaboration sites reinforces the tendency to view software as a research product of equal standing to peer reviewed publications.

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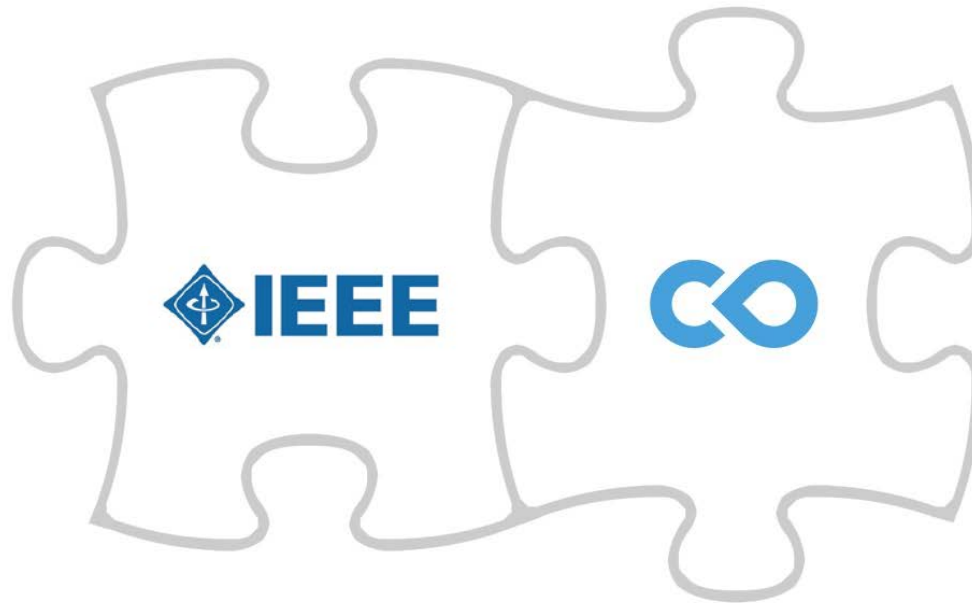
IEEE - Code Ocean

February, 2017

What is Code Ocean

An online code execution platform that integrates with any scholarly platform.

https://codeocean.com/

Feb. 2017, IEEE and Code Ocean launch joint effort to link journal publications with code

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Publisher or repository platform

Plus Code Ocean's technology

22 IEEE journals in the beta test

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Published Compute Capsule distribution

- Pre- publication
- Post- publication

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http://ieeexplore.ieee.org/document/8063416/algorithms

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Challenges associated with viewing code, data, and even hardware as primary research products:

- Need to change an established culture to accept *versioning*.

- Need to develop scalable approaches to peer review of non-article research artifacts.

- Probably need new systems of *badging* along the lines being developed by the ACM.

- Code, data, and the associated research record itself need badges.

- Need to understand the boundary between legitimate reuse and plagiarism.

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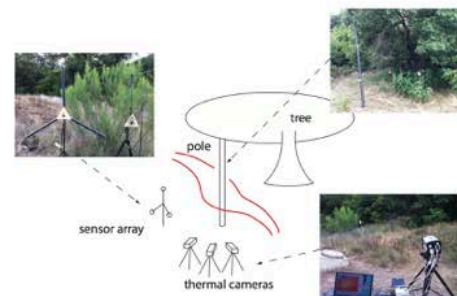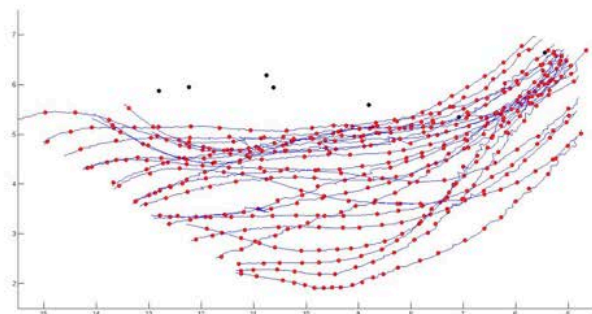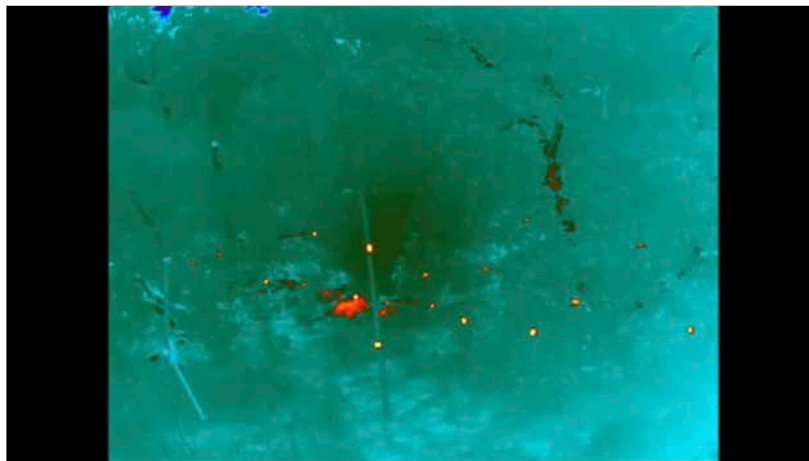# Systems Engineering and Reproducible Research

Challenges associated with cross disciplinary research:

Data

Myotis velifer

15 TB

250 MB

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Thank you