CURRICULUM VITAE

Giansimone Perrino, PhD

Postdoctoral Research Associate

Imperial College London

Department of Bioengineering & Imperial College Centre for Synthetic Biology

Royal School of Mines, Exhibition Road, London SW7 2AZ, UK

CURRENT POSITION

12/2020 – Present

Postdoctoral Researcher — Department of Bioengineering, **IMPERIAL COLLEGE LONDON**, London, UK. Advisor: Prof. Guy-Bart STAN, co-advisor: Dr Rodrigo LEDESMA-AMARO.

EDUCATION

03/2014 – 05/2017

Doctor of Philosophy — **INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING**, University of Naples Federico II, Naples, Italy. Dissertation: Modeling and control of gene expression dynamics in yeast. Mentor: Prof. Diego DI BERNARDO; co-mentor: Prof. Mario DI BERNARDO.

03/2009 – 11/2013

Master of Science — **AUTOMATION ENGINEERING**, University of Naples Federico II, Naples, Italy. *Summa cum laude*. Thesis: Analysis and feedback control of cellular populations. Advisors: Prof. Mario DI BERNARDO and Prof. Diego DI BERNARDO.

09/2005 – 03/2009

Bachelor of Science — **COMPUTER ENGINEERING**, University of Naples Federico II, Naples, Italy. *Summa cum laude*. Thesis: Time diversity in packet switching networks: analysis of performance in emulated network scenarios. Advisor: Prof. Antonio PESCAPÈ.

RESEARCH EXPERIENCE

05/2017 – 12/2020

Postdoctoral Researcher — **TELETHON INSTITUTE OF GENETICS AND MEDICINE**, Pozzuoli, Italy. Advisor: Prof. Diego DI BERNARDO.

i. Developed and tested a cybergenetics platform to synchronise yeast cell cycle.
ii. Designed and numerically validated biomolecular embedded controllers to synchronise yeast cell cycle.
iii. Designed and numerically validated a reinforcement learning control strategy (Q-learning algorithm) to control gene expression in yeast.

02/2016 – 02/2017

Graduate Researcher — **CENTER FOR ADVANCED BIOMATERIALS FOR HEALTHCARE**, Italian Institute of Technology (IIT), Naples, Italy.

i. Fabrication and testing of microfluidics devices for single-cell RNA-seq.

01/2014 – 04/2017

Graduate Researcher — **TELETHON INSTITUTE OF GENETICS AND MEDICINE**, Pozzuoli, Italy. Advisor: Prof. Diego DI BERNARDO.

i. Developed and tested a cybergenetics platform for external (computer-based) feedback control of gene expression in yeast. Designed and validated different control strategies.

ii. Exploited the cybergenetics platform to quantitatively characterise a pathological hallmark of the Parkinson's disease, that is the α-synuclein aggregation. Developed a binary classifier to detect α-synuclein inclusions.

09/2008 – 03/2009

Undergraduate Researcher **COMPUTER ARCHITECTURES AND NETWORKS LAB**, Department of Computer and Systems Engineering, University of Naples Federico II, Naples, Italy. Advisor: Prof. Antonio PESCAPÈ.

i. Contributed to the development of *TimeD*, a tool written in C++ that implements time diversity in packet switching networks. Tested the tool performance in emulated networks using the tool *D-ITG*.

TEACHING EXPERIENCE

Teaching Assistant **MODELLING in BIOLOGY**, B.Eng. and M.Eng. course, Department of Bioengineering, Imperial College London, UK. Academic years: 2021/2022.

i. Help in exam questions design.
ii. Second marking.

Second Marking of MSc reports **SECOND MARKING** of M.Sc. final reports in the Department of Bioengineering, Imperial College London. Academic years: 2020/2021 (September 2021), and 2021/2022 (June 2022).

Teaching Assistant **SYSTEMS AND SYNTHETIC BIOLOGY**, module in M.Sc. INDUSTRIAL BIOENGINEERING, University of Naples Federico II, Naples, Italy. Academic years: 2016/2017, 2017/2018, 2018/2019, and 2019/2020.

i. Course design, preparation, and lecturing.
ii. Tutorials preparation and supervision.
iii. Help in exam questions design and marking.

Teaching Assistant **SYSTEMS ANALYSIS FOR BIOENGINEERING**, module in M.Sc. INDUSTRIAL BIOENGINEERING, University of Naples Federico II, Naples, Italy. Academic years: 2016/2017 and 2017/2018.

i. Course preparation and lecturing.
ii. Tutorials preparation and supervision.
iii. Help in exam questions design and marking.

Teaching Assistant **MODELS FOR PREDICTION AND OPTIMIZATION**, module in M.Sc. BIOMEDICAL ENGINEERING, University of Naples Federico II, Naples, Italy. Academic year: 2015/2016.

i. Course preparation and lecturing.
ii. Tutorials preparation and supervision.
iii. Help in exam questions design and marking.

HONOURS AND AWARDS

Scholarship Fondazione Telethon Ph.D. Scholarship, 2014–2017.

JOURNAL, CONFERENCE AND GRANT REVIEWS, PANELS, EVENTS ORGANISATION

Funding bodies reviewer UKRI: Future Leaders Fellowships Peer Review College Member.

Journal papers reviewer — Reviewer for international peer-reviewed journal papers: Scientific Reports, npj Systems Biology and Applications, Journal of the Royal Society Interface, Frontiers in Bioengineering and Biotechnology, International Journal of Bifurcation and Chaos, Complexity, Mathematical Problems in Engineering, Physiology.

Conference papers reviewer — Reviewer for international peer-reviewed conference papers: IEEE Conference on Decision and Control (CDC), European Control Conference (ECC).

OUTREACH

Scientific disseminator — I had the honour to act as a scientific disseminator for the non-profit charity Fondazione Telethon.

PROFESSIONAL AFFILIATIONS

Member — IEEE, IEEE Control Systems Society.

Affiliate — International Federation of Automatic Control (IFAC).

COMPETENCIES AND SKILLS

Languages — Italian, mother tongue; English, proficient; Latin, intermediate.

Core Skills — Dynamical systems; Control theory; Complex systems; Nonlinear dynamics and control; Optimisation; Design, analysis, and control of bio-systems; Microfluidics; Object-oriented programming (OOP).

Interpersonal Skills — Communication, Teamwork, Responsibility, Decision making, Problem solving, Results orientation.

Programming languages — Python, R, MATLAB, C++.

Tools — NumPy, SciPy, Pandas, Seaborn, PyTorch, scikit-image, Jupyter Notebook, Git, LaTeX, Markdown, Simulink, Adobe Illustrator, Affinity Designer.

PRESENTATIONS

Invited talks

[IT01] Department of Engineering Mathematics, University of Bristol, May 2020; Bristol, United Kingdom. *Cybergenetics: When control theory meets biology*.

Selected Oral Presentations

[OP05] 2022 American Control Conference (ACC), June 2022; Atlanta, GA, USA. *Robust set-point regulation of gene expression using resource competition couplings in mammalian cells*. Rapid interactive (RI) session.

[OP04] 21st IFAC World Congress (IFAC), July 2020; Berlin, Germany. *Synchronisation of yeast cell cycle through quorum sensing coupling*. Open invited track: Trends in control theory at the interface of Systems & Synthetic Biology.

[OP03] 18th European Control Conference (ECC), June 2019; Naples, Italy. *Towards feedback control of the cell-cycle across a population of yeast cells*. Invited session.

[OP02] 55th IEEE Conference on Decision and Control (CDC), December 2016; Las Vegas, Nevada, USA. *Modelling, simulation and control of single cell expression dynamics of the galactose-inducible promoter in yeast.* Invited session.

[OP01] 6th IFAC Conference on Foundations of Systems Biology in Engineering (FOSBE), October 2016; Magdeburg, Germany. *Control of gene expression for the study of neurodegenerative disorders: a proof-of-principle experimental study*.

Poster Presentations

[PP04] 2022 American Control Conference (ACC), June 2022; Atlanta, GA, USA. *Robust set-point regulation of gene expression using resource competition couplings in mammalian cells.*

[PP03] V Congresso del Gruppo Nazionale di Bioingegneria (GNB 2016), June 2016; Naples, Italy. *Control of gene expression for the study of neurodegenerative disorders*.

[PP02] Design, optimization and control in systems and synthetic biology (DOC '15) workshop, November 2015; Paris, France. *In-vivo real-time control of gene expression: a comparative analysis of feedback control strategies in yeast.*

[PP01] Synthetic Biology: Engineering, Evolutions & Design (SEED 2015) conference, June 2015; Boston, Massachusetts, USA. *How to best control gene expression in cell populations in real-time?*

PUBLICATIONS

Preprints (or Unpublished Papers)

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Journal Papers

[J07] Atkinson, E., Tuza, Z., **Perrino**, **G.**, Stan, G.-B., and Ledesma-Amaro, R., 2022. Resource-aware whole-cell model of division of labour in a microbial consortium for complex-substrate degradation. *Microbial Cell Factories*, *21*(1), pp.1-12. DOI: 10.1186/s12934-022-01842-0

[J06] **Perrino**, **G.**, Hadjimitsis, A., Ledesma-Amaro, R., and Stan, G.-B., 2021. Control engineering and synthetic biology: working in synergy for the analysis and control of microbial systems. *Current Opinion in Microbiology, 62*, pp.68–75. DOI: 10.1016/j.mib.2021.05.004

[J05] **Perrino**, **G.***, Napolitano, S.*, Galdi, F., La Regina, A., Fiore, D., Giuliano, T., di Bernardo, M., and di Bernardo, D., 2021. Automatic synchronisation of the cell cycle in budding yeast through closed-loop feedback control. *Nature communications*, *12*(1), 2452. Preprint available on *bioRxiv*, p. 398768. DOI: 10.1038/s41467-021-22689-w (*Co-first authors)

[J04] de Cesare, I., Zamora-Chimal, C. G., Postiglione, L., Khazim, M., Pedone, E., Shannon, B., Fiore, G., **Perrino**, **G.**, Napolitano, S., di Bernardo, D., Savery, N. J., Grierson, C., di Bernardo, M. and Marucci, L., 2021. ChipSeg: an automatic tool to segment bacteria and mammalian cells cultured in microfluidic devices. *ACS Omega*, *6*(4), pp.2473-2476. Preprint available on *bioRxiv*, p. 225045. DOI: 10.1021/acsomega.0c03906

[J03] **Perrino**, **G.**, Wilson, C., Santorelli, M. and di Bernardo, D., 2019. Quantitative Characterization of α-Synuclein Aggregation in Living Cells through Automated Microfluidics Feedback Control. *Cell Reports*, *27*(3), pp.916-927. DOI: 10.1016/j.celrep.2019.03.081

[J02] Rea, D., **Perrino**, **G.**, di Bernardo, D., Marcellino, L. and Romano, D., 2019. A GPU algorithm for tracking yeast cells in phase-contrast microscopy images. *The International Journal of High Performance Computing Applications*, *33*(4), pp.651-659. DOI: 10.1177/1094342018801482

[J01] Fiore, G.*, **Perrino**, **G.***, Di Bernardo, M. and Di Bernardo, D., 2016. *In vivo* real-time control of gene expression: a comparative analysis of feedback control strategies in yeast. *ACS synthetic biology*, *5*(2), pp.154-162. DOI: 10.1021/acssynbio.5b00135 (*Co-first authors)

Refereed Conference Papers

[C07] **Perrino**, **G.**, and Stan, G.-B., 2022. Robust set-point regulation of gene expression using resource competition couplings in mammalian cells. *In Proceedings of 2022 American Control Conference (ACC)*, pp.1373-1378, Atlanta, GA, USA, 8-10 June 2022. DOI: 10.23919/ACC53348.2022.9867225

[C06] **Perrino**, **G.**, and di Bernardo, D., 2020. Synchronisation of yeast cell cycle through quorum sensing coupling. *In Proceedings of 21st IFAC World Congress, IFAC-PapersOnLine*, *53*(2), pp.16779-16784, Berlin, Germany, 12-17 July 2020. Preprint available on *bioRxiv*, p.026179. DOI: 10.1016/j.ifacol.2020.12.1143

[C05] **Perrino**, **G.***, Fiore, D.*, Napolitano, S.*, Galdi, F., La Regina, A., di Bernardo, M. and di Bernardo, D., 2019. Feedback control promotes synchronisation of the cell-cycle across a population of yeast cells. *In Proceedings of 2019 58th IEEE Conference on Decision and Control (CDC)*, pp.933-938, Nice, France, 11-13 December 2019. Preprint available on *bioRxiv*, p.590844. DOI: 10.1109/CDC40024.2019.9030216 (*Co-first authors)

[C04] Napolitano, S., Ruolo, I., **Perrino**, **G.**, and di Bernardo, D., 2019. TFEB dynamical model reveals a novel feedback loop biological mechanism. *In Proceedings of 8th Conference on Foundations of Systems Biology in Engineering (FOBSE), IFAC-PapersOnLine*, *52*(26), pp.213-218, València, Spain, 15-18 October 2019. DOI: 10.1016/j.ifacol.2019.12.260

[C03] **Perrino**, **G.***, Fiore, D.*, Napolitano, S., di Bernardo, M. and di Bernardo, D., 2019. Towards feedback control of the cell-cycle across a population of yeast cells. *In Proceedings of 2019 18th European Control Conference (ECC)*, pp.2644-2650, Naples, Italy, 25-28 June 2019. Preprint available on *bioRxiv*, p.467803. DOI: 10.23919/ECC.2019.8796301 (*Co-first authors)

[C02] **Perrino**, **G.** and di Bernardo, D., 2016. Modelling, simulation and control of single cell expression dynamics of the galactose-inducible promoter in yeast. *In Proceedings of 2016 55th IEEE Conference on Decision and Control (CDC)*, pp.3344-3349, Las Vegas, NV, USA, 12-14 December 2016. DOI: 10.1109/CDC.2016.7798772

[C01] **Perrino**, **G.**, Wilson, C., Santorelli, M. and di Bernardo, D., 2016. Control of gene expression for the study of neurodegenerative disorders: a proof-of-principle experimental study. *In Proceeding of 6th IFAC Conference on Foundations of Systems Biology in Engineering (FOSBE), IFAC-PapersOnLine*, *49*(26), pp.8-13, Magdeburg, Germany, 9–12 October 2016. DOI: 10.1016/j.ifacol.2016.12.095

Ph.D. Thesis

Perrino, **G.**, 2017. Modeling and control of gene expression dynamics in yeast. University of Naples Federico II, Naples, Italy. DOI: 10.6093/UNINA/FEDOA/11610