Denis Patterson

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Research Interests

Applied Analysis Integral/integro-differential equations, stochastic processes and applications, PDEs

Mathematical Biology Ecology (vegetation models), neuroscience/development (cell fate models)

Academic Career

Nov. 2020–present	**Postdoctoral Research Associate**, Princeton University Princeton Environmental Institute Mentor: Prof. Simon A. Levin
July 2018–Oct. 2020	**Postdoctoral Research Associate**, Brandeis University Department of Mathematics Mentor: Prof. Jonathan D. Touboul
May 2017–May 2018	**Assistant Professor & Maths Learning Centre Director** Dublin City University, School of Mathematical Sciences
Oct. 2013–Apr. 2018	**PhD in Applied Mathematics**, Dublin City University Thesis Title: *Asymptotic Growth in Nonlinear Stochastic and Deterministic Functional Differential Equations* Advisor: Prof. John Appleby Examiners: Prof. Sjoerd Verduyn Lunel (U. Utrecht), Prof. Eugene O'Riordan (DCU)
2009–2013	**BSc in Actuarial Mathematics**, Dublin City University First class honours – graduated first in class

Publications

Preprints

[P2] J. A. D. Appleby and **D. D. Patterson**, *Growth and fluctuation in perturbed nonlinear Volterra equations*, arXiv preprint.

[P1] J. Feng, W. H. Hsu, **D. D. Patterson**, C. S. Tseng, Z. H. Zhuang, H. W. Hsin, Y.T. Huang, J. D. Touboul and S.J. Chou, *COUP-TFI specifies entorhinal cortex and determines the location and integrity of its border through cell affinity mechanisms*, submitted.

Peer Reviewed Journal Articles

[J8] **D. D. Patterson**, S. A. Levin, A. C. Staver, J. D. Touboul, *Probabilistic foundations of spatial mean-field models in ecology and applications*, SIAM Journal on Applied Dynamical Systems, accepted.

[J7] J. A. D. Appleby and **D. D. Patterson**, *Blow–up and superexponential growth in superlinear Volterra equations*, Discrete & Continuous Dynamical Systems Series A, Vol. 38, No. 8 (2018), 3993–4017.

[J6] J. A. D. Appleby and **D. D. Patterson**, *Growth rates of sublinear functional and Volterra differential equations*, SIAM Journal on Mathematical Analysis, Vol. 50, No. 2 (2018), 2086–2110.

[J5] J. A. D. Appleby and **D. D. Patterson**, *Memory dependent growth in sublinear Volterra differential equations*, Journal of Integral Equations and Applications, Vol. 29, No. 4 (2017), 531–584.

[J4] J. A. D. Appleby and **D. D. Patterson**, *Large fluctuations and growth rates of linear Volterra summation equations*, Journal of Difference Equations and Applications, Vol. 23, No. 6 (2017), 1047–1080.

[J3] J. A. D. Appleby and **D. D. Patterson**, *Growth rates of solutions of superlinear ordinary differential equations*, Applied Mathematics Letters, Vol. 71 (2017), 30–37.

[J2] J. A. D. Appleby and **D. D. Patterson**, *Hartman–Wintner growth results for sublinear functional differential equations*, Electronic Journal of Differential Equations, Vol. 2017, No. 21 (2017), 1–45.

[J1] J. A. D. Appleby and **D. D. Patterson**, *On the admissibility of unboundedness properties of forced deterministic and stochastic sublinear Volterra summation equations*, Electronic Journal of Qualitative Theory of Differential Equations, No. 63 (2016), 1–44.

Conference Papers

[C3] J. A. D. Appleby and **D. D. Patterson**, *Classification of convergence rates of solutions of perturbed ordinary differential equations with regularly varying nonlinearity*, Electronic Journal of Qualitative Theory of Differential Equations, Proceedings of the 10th Colloquium on the Qualitative Theory of Differential Equations, No. 3 (2016), 1–38.

[C2] J. A. D. Appleby and **D. D. Patterson**, *Subexponential growth rates in functional differential equations*, Discrete and Continuous Dynamical Systems Supplement (2015), 56–65.

[C1] J. A. D. Appleby and **D. D. Patterson**, *On necessary and sufficient conditions for preserving convergence rates to equilibrium in deterministically and stochastically perturbed differential equations with regularly varying nonlinearity*, Recent Advances in Delay Differential and Difference Equations, Springer Proceedings in Mathematics & Statistics 94 (2014), 1–85.

Academic Talks

Mar. 2020	*AMS Eastern Sectional Meeting, Tufts University, USA*
Oct. 2019	*ICMA VII*, Arizona State University, USA
Sep. 2019	*Dynamics Seminar*, Boston University, USA
May. 2019	*SIAM DS19*, Snowbird, Utah, USA
Apr. 2019	*Mathematics and Statistics Seminar*, University of Limerick, Ireland
July 2017	*Equadiff 2017*, Slovak University of Technology in Bratislava, Slovakia
May 2017	*SIAM UKIE Chapter Student Meeting*, NUI Galway, Ireland (Best Talk Prize)
Apr. 2017	*British Applied Mathematics Colloquium*, University of Surrey, UK
Mar. 2017	*Mathematics and Statistics Seminar*, University of Limerick, Ireland
July 2016	*11th AIMS Conference*, Orlando, Florida, USA
July 2015	*ICDEA 2015*, Białystok University of Technology, Poland
July 2015	*10QTDE*, Bolyai Institute, University of Szeged, Hungary
Dec. 2014	*SIAM Student Meeting*, NUI Galway, Ireland
July 2014	*10th AIMS Conference*, Universidad Autonoma de Madrid, Spain

Academic Honours & Awards

2017	**Outstanding Graduate Researcher Award**, Dublin City University
2013–2017	**Government of Ireland Postgraduate Scholarship**, Irish Research Council
2013	**Student Actuary Prize**, Society of Actuaries in Ireland
2012	**Hamilton Award for Mathematics**, Royal Irish Academy

Programming/Software

C++, MATLAB/Scilab, Mathematica, XPP/Auto, Matcont, FreeFEM++, R, Hive, SQL, GeoGebra, LaTeX

Teaching Experience

Summer 2020	**Lecturer**, Differential Equations, Brandeis University
Fall 2019	**Lecturer**, Probability, Brandeis University
Spring 2019	**Lecturer**, Multivariate Calculus, Brandeis University
Winter 2017	**Lecturer**, Simulation for Finance (graduate course), Dublin City University Theory and simulation of stochastic processes with financial applications.
Spring 2016	**Lecturer/Tutor**, Algebra 2, University of Limerick

Undergraduate Research Projects supervised:

Fall 2020	Jingman Li & Yuning Liu (Applied Math, Brandeis), "Network models for Covid-19 spread"
Spring 2020	Hange Zhu (Applied Math, Brandeis), "Pattern formation in heterogeneous domains"
Summer 2019	Hanyu Song (Applied Math, Brandeis), "Mathematical models of somitogenesis"

Professional Activities & Affiliations

Selected for the AMS Mathematical Research Community "Dynamics of Infectious Diseases" (2020-2021);

Reviewer for *Applied Mathematics and Computation*, *Journal of Difference Equations and Applications*, *Electronic Journal of the Qualitative Theory of Differential Equations*, and *Mathematical Biosciences*;

Judge for SCUDEM V 2020 (undergraduate mathematical modeling competition);

Member of the Society for Industrial and Applied Mathematics (SIAM);

Member of the International Society of Difference Equations (ISDE);

Organised the Brandeis Mathematical Biology Seminar series 2018–2019;

Organised the DCU Mathematical Sciences Postgraduate Seminar series 2014–2017.