Damien Jade Duff

Developer & Researcher in Artificial Intelligence
(Course of Life)

I am a researcher and developer in machine learning, computer vision, robotics, and AI, and have moved back into industry. I have over a decade of experience in these, as project lead, researcher and educator at university, and as a consultant & engineer in industry.

Work Experience

2018-ongoing: ***Consultant (Machine Learning)***, Daemon Solutions Ltd.

> With my experience in Machine Learning, Artificial Intelligence, Computer Vision, and related areas, I am supporting a pivot of Daemon Solutions into machine learning; we work to provide our clients with state-of-the-art solutions using modern best practices.

2013-2019: ***Lecturer***, Department of Computer Engineering, Istanbul Technical University.

> Lecturing in one of the top universities in Turkey while conducting research in **computer vision, machine learning, deep learning, assistive sensing, robotics, and artificial intelligence**. Initiated and lead two publicly funded research projects. Continuous improvement of course delivery, content, and concept. Active in research and administrative roles, including learning measurement and evaluation.

2018-2019: ***Machine Learning Lead***, Faultless AI.

> I supported this ambitious start-up using my experience in **deep learning, machine learning, computer vision**, and related areas. We are working on developing a core Industry 4.0 product which has the potential to be transformative in the industry, while rolling out tailored solutions to select customers.

2012-2013: ***Postdoctoral Researcher***, Cognitive Robotics Laboratory, Sabancı University.

> A Scientific and Technological Research Council of Turkey project about **3D perception and reasoning** for **robot manipulation**, and entered a mobile manipulation competition. I was the computer vision expert on our team.

2010-2012: ***Lecturing and tutoring***, Department of Computer Science, Istanbul Bilgi University.

> Developed new courses in robotics and computer graphics, taught academic skills.

2005-2010: ***Tutoring, lecturing***, School of Computer Science, University of Birmingham.

> Robot lab demonstration & lab admin, tutoring + guest lectures.

2002-2005: ***Analysis, programming, and site lead***, Talgentra NZ (Gentrack) Ltd, Auckland.
1999-2002: ***Laboratory Tutor***, Department of Computer Science, University of Auckland
1998-2001: ***Labouring, Manufacturing, Office Work***, Student Job Search, Auckland
1997-2005: ***Bookshop Sole Charge & Ordering***, Russell Bookshop, Russell, Northland, N.Z.
1997-1997: ***Landscape Labourer***, Mike Price Landscape Developments, Kerikeri, N.Z.
1996-1997: ***Building Labourer***, John Gebbie, Builder, Russell, Northland, N.Z.

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Damien Jade Duff CV
(course of life)

Education

2005—2011: **PhD in Artificial Intelligence**, University of Birmingham Intelligent Robotics Lab.

> Improving monocular **object tracking** for **robot manipulation** scenarios by incorporating prior knowledge using rigid object simulation (**computer vision**).

> **University of Birmingham graduate development courses**:
> Residential Researcher Teamwork.
> Project Management in Research.
> Small Group Teaching.
> Effective Researcher.
> Presentation Skills.
> Managing Research Relationships.

2004—2005: **Postgraduate Diploma in Psychology**, University of Auckland (Part-time).

> Set up, ran and analysed the results from an EEG experiment using "dichotic pitch" to investigate brain processing of stereo sound cues.

2002—2002: **BSc Honours in Computer Science**, University of Auckland (First Class, A Grade).

> First-class A honours is the highest achievement possible in this restricted-entry accelerated degree.

1998—2001: **BA/BSc Psychology & Computer Science**, University of Auckland (Conjoint).

> Minoring in Mathematics and English (literature and linguistics), this was an accelerated conjoint degree with two majors and two minors.

Other Roles

2012: Member, Team Efes, Robocup@Work competition, IROS, Villamoura.

2011: İTÜ Robot Olympiad, Invited Speaker (topic: robot learning).

2006-2009: University of Birmingham Young Greens Society President, Secretary.

> Managed society meetings, organised public events, and engaged in and promoted dialog .

Projects & Awards

2017, 2018 & 2019: Best educator award Computer Engineering Department (student selected).
2018: Advisor of "Best Graduation Project" poster (Pelin Hakverir).
2018: Nvidia GPU Academic Grant Program: 1 × TitanX GPU.
2017-2019: Scientific and Technological Research Council of Turkey "career" project 116E167.

> 116E167: **Project proposer, manager and technical lead**. "Investigation of depth reconstruction from single views and application to autonomous robots". Applying recent advances in **deep learning** as applied to the **computer vision** problem of depth from single images (a computer vision problem we are only now starting to tackle well) to real **robot** problems. Budget: 223,800 Turkish Lira.

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2014-2017: Scientific and Technological Research Council of Turkey “starting” project 114E443.

> 114E443: **Project proposer, manager and technical lead**. "Spatial auditory-vision sensory substitution using range cameras". Encoding 3D surfaces as sound for sensory augmentation. Involving **3D point cloud processing, 3D real-time computer vision and signal processing**. Budget: 58,866 Turkish Lira.

2014-2017: University funded "scientific research" project 37964. 26,000 Turkish Lira budget.

> Postdoctoral project: "Exploiting knowledge and physical dynamics for **vision and tracking**". Involving integrating object recognition with action languages for planning-drivern perception; also, physics-based tracking.

2012-2013: Scientific & Technological Research Council of Turkey 2216 postdoc at Sabancı University.
2012: BRICS (Best pRactice In robotiCS) research camp travel grant.
2012: IEEE travel grant (Safety Search and Rescue Robotics Summer School, Alanya).
2010: euCognition travel grant (iCub summer school, Sestri Levante).
2009-2010: CogX EU FP7 (FP7-IST215181) project scholarship.
2008-2009: CoSy EU FP6 (FP6-004250-IP) project scholarship.
2006-2008: ORSAS scholarship supporting doctoral studies (UK government).
2005-2008: University of Birmingham School of Computer Science departmental PhD scholarship.
2002: First Class Honours; University of Auckland Faculty of Science Bursary.
2002: Full car and motorcycle driving license.
2001: Senior Prizes, Departments of Computer Science & Psychology, University of Auckland.
2001: University of Auckland, Faculty of Science Summer Scholarship.
1996: Dux (c.f. valedictorian), Bay of Islands College.
1996: Head Prefects Cup, Bay of Islands College.
1996: Senior Science Contribution Cup, Bay of Islands College.
1996: Excellence in Chemistry Cup, Bay of Islands College.
1996: Winner, impromptu speaking cup, Bay of Islands College.
1995: Distinction, Australian National Chemistry Quiz.
1994-1995: Highschool highest academic attainment, national exam prizes.
1993: Winner, junior prepared reading, Bay of Islands College.
1993: Surf Lifesaving Certificate level 1, NZ Lifesaving Society.
1993: Winner, NZ National Mental Health Awareness Week poetry competition.

Toolbox

• Machine/deep learning algorithms:
→ OpenVino, Tensorflow, MXNet, OpenCV, Pandas, Numpy/Scipy/etc., Jupyter, FastAI, Unix, DVC (object detection, text classification, recommender systems, prediction, forecasting).
(recent industry experience)
→ Pytorch, Keras/theano, Python, NumPy/SciPy/Matplotlib, Pandas, Matlab.
(tools used in scientific work, prototyping, analysis).

• Cloud / sysadmin tools:
→ GCP (Cloud Composer, AutoML, Dataflow, Bigquery), AWS (Lambda, IoT/Greengrass, Sagemaker, Step, CloudWatch, Forecast, Personalize).
(recent industry experience)
→ Unix/GNU Linux, bash, Docker, SLURM.
(used in the research projects that I lead)
(I use linux every day on my development/personal computer, script many things; I set up deep learning software on the UHEM and TRUBA supercomputers, and I recently set up two multi-user networked deep learning rigs, have done a little work recently on cloud-based projects)

• Computer vision and signal processing tools:
→ OpenCV, OpenAL, LabView, STK.
(coding robot, computer vision & sensory substitution applications).

• General and other programming tools:
→ C/C++, Python, Java, Bash, Make, CMake, Visual Studio, Boost, Qt, OpenGL, Novodex/PhysX, Crystal Reports, UniBasic/Pick, SQL, PyQt, PyOpenGL, PyOpenCV, (Emacs) Lisp, Airflow, DoIt.
(research project coding, day-to-day coding, and industry experience).
→ HTML, PHP, Heroku, Python Bottle, AJAX, pymunk, pygame, RoboJDE, GPSS, Unity.
(used in teaching & student projects).
→ Django, Postgres.
(recent industry experience)

• 3D and point-cloud processing:
→ OpenCV, Point Cloud Library.
(used in my real-time sensory substitution project, have made contributions to PCL).
→ DepthSense, Kinect, ASUS Xtion.
(devices I have worked with)

• AI planning & logic programming:
→ Prolog, Answer Set Programming, CCalc.
(tools used in scientific work, prototyping, analysis).

• Software engineering tools (industry experience & in my research groups).
→ Git, GitHub, Bitbucket, JIRA.
(recent industry experience)
→ Trello, Mercurial, Mediawiki, GitLab, Docker, Atlassian CI.
(used in my research groups and projects)
→ Subversion, CVS.
(earlier industry experience)

• Software tools:
→ Latex, Libreoffice, Blender 3D, Inkscape, Audacity, GIMP, Scribus, Macsyma, Sympy.
(used day-to-day, to prepare presentation materials, material for research projects)

• Robotics (research – competitions – teaching).
→ ROS (extensively), YARP, move_base, MoveIt!, Gazebo, OpenRave.
(most robots we work with use ROS, and I teach it to graduating students)
→ Pioneer 3DX, TeleMe2, Turtlebot, Kuka Youbot, iCub, Hokuyo scanner, PhantomX Reactor.
(robots and devices I have worked with extensively)

Other Skills

• Probability & statistics (*used extensively in research, as a part of machine learning; I also teach probability and statistics and follow the literature on scientific method and statistics*).

• Scientific methods & experiment design (*worked in both psychology and computer engineering research*).

• Stochastic processes, artificial intelligence, optimization, computer vision, rigid body simulation (*used in my projects and teaching formally and informally*).

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• Scientific and prose writing (*undergraduate degree in English, writing awards, and a scientific career; I teach technical communications to undergraduates*).

• Financial programming (*2.5 years in the software / utilities / billing industry, early 2000s*).

• Time/project management techniques (*courses taken during PhD + running publicly funded projects & research groups*).

• Practical pedagogy (*constant reading + tutoring, lecturing and informal undergraduate research groups*).

• Intermediate Turkish (*8 years in Turkey*).

• Public speaking (*lecturing for almost a decade with teaching prizes, theatre experience; I teach presentation skills*).

• EEG setup and analysis (*published graduate project*).

• Basic mechanics and electronics (*picked up in the course of working and researching with robots*).

Publications

Pourghaemi, H., Gholamalizadeh, T., Mhaish, A., İnce, G. & Duff, D.J. (2018). **Real-time Shape-based Sensory Substitution for Object Localization and Recognition**. ACHI: Int. Conf. Advances in Computer-Human Interactions, Nice, France.

Gholamalizadeh, T., Pourghaemi, H., Mhaish, A., İnce, G. & Duff, D.J. (2017). **Sonification of 3D Object Shape for Sensory Substitution: An Empirical Exploration**. ACHI: Int. Conf. Advances in Computer-Human Interactions, Nice, France *(best paper award)*.

Mhaish, A., Gholamalizadeh, T., İnce, G. & Duff, D.J. (2016). **Assessment of a Visual to Spatial-Audio Sensory Substitution System**. SIU: Signal Processing & Communications Applications Conference, Zonguldak, Turkey.

Duff, D.J. (2015). **Orientation averaging using spatial extension**. TORK: Turkish Robotics Conference, Istanbul.

Duff, D.J., Erdem, E. & Patoğlu, V. (2013). **Integration of 3D Object Recognition and Planning for Robotic Manipulation: A Preliminary Report**. ICLP Workshop on Knowledge Representation and Reasoning in Robotics, Istanbul.

Duff, D.J. (2011). **Visual motion estimation and tracking of rigid bodies by physical simulation**. PhD Thesis. University of Birmingham.

Duff, D.J., Mörwald, T., Stolkin, R., & Wyatt, J.L. (2011). **Physical simulation for monocular 3D model based tracking**. IEEE International Conference on Robotics & Automation, Shanghai, China. 5218-5225.

Duff, D.J., Wyatt, J.L., & Stolkin, R. (2010). **Motion estimation using physical simulation**. IEEE International Conference on Robotics & Automation, Anchorage, Alaska. 1511-1517.

Johnson, B.W., Hautus, M.J., Duff, D.J., & Clapp, W.C. (2007). **Sequential processing of binaural interaural timing differences for sound source segregation and spatial localization: Evidence from event-related cortical potentials**. Psychophysiology, 44(4), 541-551.

Duff, D.J., & Guesgen, H.W. (2002). **An evaluation of buffering algorithms in fuzzy GISs**. GIScience, Boulder, Colarado, 80-92.

References

Akram Dweikat (current lead). ML/AI Lead, Daemon Solutions. UK.

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