IRISH RESEARCH COUNCIL
An Chomhairle um Thaighde in Éirinn

Government of Ireland Postgraduate Scholarship Scheme 2017:

Indicative Applicant Form

This Word document is provided solely for information purposes. All applicants must create and complete their submission through the online system by the deadline of **16:00 (Irish time) on 2 November 2016.** Please see the **2017 Terms and Conditions** and **Guide for Applicants** on the Irish Research Council website for further information prior to submitting your application online. All sections must be completed in full.

Eligibility Quiz

Does your proposed research deal with any of the following prohibited areas? • Research activity aimed at human cloning for reproductive purposes • Research activity intended to modify the genetics of human beings that could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be funded) • Research activities to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer	
Yes	
No	☐

Have you had two previous unsuccessful applications to the Government of Ireland Postgraduate Scholarship scheme (including strategic partner themes, applications to the EMBARK Scheme previously run by the Irish Research Council for Science, Engineering and Technology and the Government of Ireland Scholarship Scheme previously run by the Irish Council for Humanities and Social Sciences)?	
Yes	
No	☐

Do you have a first class or upper second-class honours bachelor's (or equivalent) degree? If examination results are not known at the time of application, the Council may make a provisional offer on condition that the applicant's final grade for their bachelor's (or equivalent) degree is a first class or upper second-class honours.	
Yes	
No	
Bachelor's degree results unknown at time of application	☐

If no: Do you have a master's degree?	
Yes	s
No	☐

Applicant Details

Select the appropriate scholarship theme for which you are applying:	
Government of Ireland Postgraduate Scholarship	☐
Andrew Grene Postgraduate Scholarship in Conflict Resolution	
Environmental Protection Agency Postgraduate Scholarship	
Department of Children and Youth Affairs Growing Up in Ireland Postgraduate Scholarship	

Application in Irish:	
Yes	
No	☐

There is an option on the system at this point to upload an English translation should you wish to do so. This will accompany your research proposal. The system will only accept documents in PDF format.

Name: John Cosnett

Email address: j.cosnett1@nuigalway.ie

Contact telephone number: 087 9297553

Contact address: Drumcortha, Killeshandra, County Cavan, Ireland, H12 HY22

Gender:	
Male	☐
Female	

Date of birth: 03/07/1993

ORCID ID*: 0000000295469754*

ORCID ID provides a persistent digital identifier that distinguishes you from every other researcher. If you do not currently have an ORCID ID, please register for one at www.orcid.org and provide us with your unique 16-digit identifier

What is your nationality, i.e. your passport-issuing country?

Ireland

Are you a national of a European Economic Area (EEA)* member state or Switzerland?	
Yes	☐
No	

*The EEA comprises the EU member states together with Iceland, Norway and Liechtenstein

Will you have been ordinarily resident* in an EEA member state or Switzerland for a continuous period of three of the five years preceding 1 October 2017?	
Yes	☐
No	

*'Ordinarily resident' denotes your place of legal and permanent residence

Will you be a new entrant to the degree for which you are seeking Council funding?	
Yes	☐
No	

If yes: Please specify the scholarship type for which you are applying:	
12-month Research Master's	
24-month Structured Research Master's	
36-month Traditional Doctoral Degree	☐
48-month Structured Doctoral Degree	

If no: Please specify the degree type for which you are currently registered:	
24-month Structured Research Master's	
36-month Traditional Doctoral Degree	☐
48-month Structured Doctoral Degree	

If no: What date did you first register for this degree?
30/05/2014

It is important that the information in this field is entered correctly as the duration of funding awarded is dependent on the date of first registration

If no: Please select your current funding source:	
Self-funded	
Student Universal Support Ireland grant	☐
Higher education institution-funded bursary or scholarship	
Central Remedial Clinic Ciaran Barry Graduate Scholarship	

If no: Please provide further details in relation to this funding source, including duration:

If no: Please indicate the duration of scholarship for which you are applying:	
12 months	
24 months	
36 months	☐

Will you be in receipt of any additional awards during the scholarship period, e.g. travel bursaries, equipment grants, etc.?	
Yes	
No	☐

If yes: Please provide further details:

Do you currently hold, or have you previously held, any other Irish Research Council awards?	
Yes	
No	☐

If yes: Please provide further details:

Applicants for a Research Master's Scholarship must not currently hold, or have previously held, a Council Postgraduate Scholarship. Applicants for a Doctoral Degree Scholarship must not currently hold, or have previously held, any Council Postgraduate Scholarship other than that which would enable them to obtain a Research Master's Degree

Academic Supervisor Details

Primary Academic Supervisor:

Name: Dr. Nicholas Devaney

Institution: National University of Ireland, Galway

Email address: nicholas.devaney@nuigalway.ie

Secondary Academic Supervisor (if applicable):

Name:

Institution:

Email address:

Referee Details

Referee 1

Name: Dr. Nicholas Devaney

Organisation or institution: National University of Ireland, Galway

Position: Lecturer

Email address: **nicholas.devaney**@nuigalway.ie

Referee 2

Name:

Organisation or institution:

Position:

Email address:

Academic Qualifications

Bachelor's Degree

Institution: National University of Ireland, Galway

Graduation date:

31 AUG 2018 MAYBE NOV 2018

Qualification type and name:

BPT1 Bachelor of Science (Physics) Applied
(School of Physics)

Final grade or grade point average: 74.58%

Examination results as detailed here must correspond with those on official transcripts

Any additional information relating to this degree can be included here, e.g. dissertation title, area of study:

Max 300 words

- DisserationTitle:= Detection of Exoplanets using Deep Neural Networks.
- AreaOfStudyOfDegree := { astronomy, optics, physics, computational physics, Quantum Physics, Applied Mathematics, Pure Mathematics, Mathematical Modelling, Experimental Lab Work }
- AreaOfStudyOfDissertation := { machine_learning, astronomy, optics, physics, datascience }

- I did a third year summer internship in the area of applying Deep learning to finding exoplanets.

- Due to difficulties getting a tutor I helped my class organize our own study sessions.

- I was awarded a prize (150 euro voucher) from my class for helping everyone work through exam papers and prepare for the Physics Lab interviews.

- I believe in the power of team work. We had more synergy than just working alone.

- Due to the lack of a tutor in third year. I helped organize group study sessions both online and in my own accomodation. We collectively prepared for lab interviews and our final third year exams.

- I used Mathematica to generate PDF's of our collaborative work to include other class mates who could not attend.

- To my surprise my fellow class mates, collectively awarded me a generous prize at the end of the year. And everyone did well.

- I helped my high functioning autistic brother to overcome his difficulties by training him in Mathematica.

Second Bachelor's Degree (if applicable)

Institution:

Graduation date: dd/mm/yyyy

Qualification type and name:

Final grade or grade point average:

Examination results as detailed here must correspond with those on official transcripts

Any additional information relating to this degree can be included here, e.g. dissertation title, area of study: *Max 300 words*

Master's Degree (if applicable)

Type:	
Taught	☐
Research	☐

Institution:

Graduation date: dd/mm/yyyy

Qualification type and name:

Final grade or grade point average:

Examination results as detailed here must correspond with those on official transcripts

Any additional information relating to this degree can be included here, e.g. dissertation title, area of study: *Max 300 words*

Second Master's Degree (if applicable)

Type:	
Taught	☐
Research	☐

Institution:

Graduation date:
dd/mm/yyyy

Qualification type and name:

Final grade or grade point average:

Examination results as detailed here must correspond with those on official transcripts

Other Education

Please provide any additional information relevant to your academic background which should include the name, location and date(s) of any training courses attended:

Max 300 words

- *ONLINE MOOCS*
- *Computer Science Edx*
- *Machine Learning Coursera*

Python, MIT open course ware, Logic,

(insert CV here)

- *Mathematica Stack Exchange 2300*
- *Project Euler programming challenge → 17th in Ireland*
- *I took part in the Irish Math Olympics in Maynooth and Limerick and came 14th in Ireland.*
- *During teenage years;; I spent many hours playing the piano. I feel that I transferred this hand –eye coordination ability to computer programming.*
- *Whilst a student at secondary school.. I used Solid Works CAD system to design and complete my leaving cert technology project. (I made an automatic physio therapy machine for the hand.)*
- *I used a 3D printer to print the gear box. And I designed and soldered the electronics from first principles.*
- *I made a designed a custom wooden desk for working with electronics using the Solid Works CAD system. It had a special environment for fume and dust extraction made from a large flowerpot and the motor from my Grannies washing machine.*
- *Using this desk I was able to make simple robots that navigated the floor.*
- *Whilst a young teenager my father brought me to florence and I was really inspired by the inventions of Leonardo DaVinci.*

I worked in my uncles pub in sligo and learned to pull a good pint.

Self-Education:

I have completed the following MOOCs to try to learn about Computer Science, which I hope will enable me to code physics simulations and find patterns in data.
1. Machine Learning: Andrew Ng; Coursera
2. Introduction to Programming with MATLAB: Vanderbilt University; Coursera 3. Introduction to Computer Science using Python; EDX; MIT;
Other MOOCs partially completed
1. Introduction to Mathematical Thinking, Keith Devlin
2. Machine Learning, Pedro Domingos
3. Introduction to Logic, Michael Genesereth
4. Artificial Intelligence, Berkeley, Dan Klein and Pieter Abbeel. 5. Differential Equations, Coursera, Paul Blanchard

JAMES BLACKWELL'S ANSWER

I received a fully funded position on the Wellcome Trust sponsored summer school for training and research experience in neural dynamics (TRENDS) held from 30/08/2017 – 01/09/2017 at Bristol University, UK. Gaining first hand experience of electrophysiological recordings (bothin vitro and in vivo), EEG recordings, brain imaging, optogenetics, data analysis workshops and practical classes on learning to code in Python

Research Achievements

Please provide any additional information regarding your research achievements to date such as publications, research awards, creation of data sets and databases, conference papers, patents, excavations, public broadcasts, stage performances, creative writing, creative productions and/or exhibitions:

Max 500 words

Please provide any additional information regarding your research achievements to date such as publications,
research awards,
creation of data sets and databases,
conference papers,
patents,
excavations, public broadcasts, stage performances, creative writing, creative productions and/or exhibitions:

Max 500 words

created several software repositories on Github to help myself and others simulate coronagraph images of exoplanets rotating in speckle fields.

created a 2 data sets for training the Inception V3 convolutional neural network for the purpose of detecting exoplanets.

Maintainer of several code repositories for machine learning and other stuff in Mathematica 11 on github

Mainly in the Wolfram Language (Mathematica Language).
Insert CV

JAMES BLACKWELL'S ANSWER

Will we be able to get a paper out of this summer internship?

Hopefully will have a conference paper

Work Experience

Please provide details of any relevant work experience, including voluntary work, to date which should include employers' names, job titles, nature of duties and responsibilities, as well as duration of employment:

Max 500 words

JAMES BLACKWELL'S ANSWER

Summer Intern, NUI Galway **June - August 2017**

- Conducted a 10-week internship supervised by Dr Niall Colgan. Title of research topic; "Experimental and numerical assessment of MRI-induced temperature change and SAR distributions in phantoms"
- This involved a detailed knowledge of how an MRI operates, what types of scans have the highest specific energy absorption rate (SAR) and why.
- I had to design a method to create a T1 doped MRI phantom and the experimental procedure to determine the temperature change from the scan.
- Gained experience in numerical analysis of the data.

ALIVE Leader, NUI Galway **Sept 2015 - Present**

- An ALIVE Leader is a student who has volunteered in a community organisation and is willing to take on a deeper role and be the liaison with the ALIVE Programme and support their fellow student volunteers.
- I organise both the Presentation and Scoil Bhride N.S homework clubs, working with volunteers and the schools.
- Gained experience co-ordinating groups of volunteers and planning out homework clubs.

Summer Intern, NUI Galway **June - July 2016**

- Conducted a 6 week internship supervised by Dr Mark Foley researching various methods of Clinical Imaging (Ultrasound, X-Ray, Computed Tomography (CT), Positron Emission Tomography (PET), Single-photon emission computed tomography (SPECT) and Magnetic Resonance Imaging (MRI)) and Radiotherapy techniques (LINAC, Brachytherapy and Orthovoltage). Gained experience in modelling a LINAC using BEAMnrc and DOSxyz.
- Shadowed Medical Physicists at the University Hospital of Galway conducting monthly CT, LINAC, Brachytherapy and Blood Irradiation QA's. Also learned about Radiotherapy Treatment planning methods.
- Gained experience in academic research and got an insight into the different types of clinical imaging.

Proposed Research

Project title:

Detection of Exoplanets using Deep Neural Networks

Max 100 words

JAMES BLACKWELLS ANSWER

Experimental and numerical assessment of MRI-induced temperature change and SAR distributions in phantoms. Application of MR thermometry to shear wave ultrasound.

Higher education institution:

: National University of Ireland, Galway
School of physics,
Applied Optics Group

Department:
: Applied Optics Group

Primary area: : Physics

Discipline: Physics

Other research area(s): Astronomy, Computer Science, Optics, Speckle

Please consult the research categorisation document available on the Irish Research Council website for further descriptions of *primary area*, *discipline* and *other research area*

Second categorisation – if interdisciplinary: Machine Learning

If your proposed research is interdisciplinary, please list the second categorisation here, i.e. *primary area*, *discipline* and *other research area*

Keywords describing proposed research:

: Deep Learning, Artificial Neural Networks, Exo-astronomy, Optics, Data Analytics, Coronagraph Optics,

Please provide an abstract for your proposed research:

Max 300 words

Deep learning algorithms, powered by advances in computation and very large datasets25, have recently been shown to exceed human performance in visual tasks such as playing Atari games26, strategic board games like Go27 and object recognition6.

Automated detection of exoplanets in noisy coronagraph videos is a challenging task. Deep convolutional neural networks (CNNs)4,5 show potential for general and highly variable tasks, across many fine-grained object categories 6–11.

We hope to demonstrate detection of exoplanets using CNNs, trained end-to-end from video directly, using only pixels and labels ('exoplanet' or 'barren') as inputs. We have trained a small proof of concept model using a dataset of 40 videos containing exoplanets and 40 videos with no exoplanets ("barren"). The coronagraph speckles were randomly generated and are different in each video. The radius of the planets motion is also random so that the planets position could be al- most anywhere in the video.
1 Section
Deep learning algorithms, powered by advances in com- putation and very large datasets25, have recently been shown to exceed human performance in visual tasks such as playing Atari games26, strategic board games like Go27 and object recognition6.
We utilize a GoogleNet Inception v3 CNN architec- ture9 that was pre- trained on approximately 1.28 mil- lion images (1,000 object categories) from the 2014 ImageNet Large Scale Visual Recognition Challenge6, and train it on our dataset using transfer learning28. Figure 1 shows the working system. The CNN is trained using 2 object classes. Our dataset is composed of computer-labelled videos,
During inference, the CNN outputs a probability distribution over these two classes.

Please provide a lay abstract for your proposed research, which will be used to inform a non-expert audience:

Max 300 words

Please provide details of your proposed research to include (a) aims, objectives and central research questions of the project, (b) how existing literature on the topic has been used to inform the proposal and (c) how the project will advance state of the art and make a contribution to existing knowledge:

Max 500 words

Aims::

Objectives::

Central Research Questions::

Existing Research has informed the proposal::

How the project will advance the state of the art and make a contribution to existing knowledge::

Please detail the research design and methodologies to be employed in carrying out your scholarship which should be described in sufficient detail to demonstrate your thorough understanding of the research topic:

Max 500 words

Detail the research design and methodologies::

To be employed in carrying out your scholarship::

Please provide a schedule to include (a) milestones and deliverables for completion of the proposed research, (b) risks that might endanger reaching these deliverables and (c) the contingency plans to be put in place in order to mitigate these risks:

Max 50

I have read papers on dermatology and medicine.

Year One:
Assess the performance and limitations of applying Deep Neural Networks to the task of detecting the presence or absence of Exo-Planets.

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RISKS:

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I would hope that this topic hasn't been done in the same way before,
But even if that was the case I can build and contribute to their code libraries
And this would accelerate the discovery of exoplanets.

And

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CONTINGENCY PLANS:

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But even if that was the case I can build and contribute to their code libraries
And this would accelerate the discovery of exoplanets.

I have also researched this topic online and to date have not yet found a similar scientific proposal.

The department could run out of money.

There could unknown unknowns that we cannot forsee.

Conundrums and complications are the essence of life itself.

If it was that easy it would have been sorted out long ago.

Yes there will be lot of small hurdles. But it is the job of a scientist to push on through to the delights of new discovery in the face of struggle.

I plan to keep fit and healthy, to study as hard as I can for the BSc and keep this flame of enthusiasm alive for the PHD if I hopefully achieve it.

Department could go on fire. and burn down.
My computer could break.

My proposed hypothesis could be difficult to implement. But this is highly unlikely as research has shown.(4)(5)

Please describe any specialist knowledge or data required to undertake your proposed research, such as language competency, technical skills or use of specialist software. If this knowledge or data is not already in place, details should be provided as to how it will be acquired over the course of the scholarship:

Max 500 words

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SPECIALIST KNOWLEDGE
SPECIALIST DATA
REQUIRED TO UNDERTAKE YOUR PROPOSED RESEARCH

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LANGUAGE COMPETANCY

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((()))

as previously stated in section X above I have achieved competancy in the following computer languages

-Mathematica 6000 hours
-Python 3000 hours
-MATLAB 2000 hours
-
-
-
-
-
-C

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TECHNICAL SKILLS

++
((()))

SUCCESSLY CARRIED OUT MANY PHYSICS EXPERIMENTS. I got 100 percent in all lab work in 3rd year as well as that I got 100 percent in both lab interviews in which I was grilled on two random experiments that I did.

I graphed and recorded data in PDF's generated in mathematica.

I enjoyed sketching diagrams of experimental apparatus.

My skillset from these labs includes
-Arduino programming
-Calculating and computing with scientific error.
-Using the OCTAVE Computer language to explore signal analysis.
-Modelling nonlinear optics systems using the OSLO optics prototyping software.

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SPECIALIST SOFTWARE

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I am an expert in the mathematica system having over 6000 hours of experience writing small Mathematica Programs.

I have libraries of mathematica packages on GITHUB...

Mathematica allows the scientist to visualise and explore data.
To do technical things
techical.

Please outline your plans for the dissemination and knowledge exchange of your research, including publications, conference attendance, poster presentations, reports and outreach activities. Details should also be provided as to how the impact of your research will be measured:

Max 500 words

Well I plan to publish my results in suitable journals asap.

We could go to a conference and then we could write something about this one.

Please outline the reasons for choosing your proposed higher education institution:

Max 400 words

Please outline the reasons for choosing your proposed academic supervisor(s):

Max 400 words

Please provide details of any proposed research trip(s) of more than four weeks' duration which you believe will be necessary for the successful completion of your scholarship:

Max 300 words

PLEASE NOTE: The following question applies ONLY to applicants for an Andrew Grene Postgraduate Scholarship in Conflict Resolution, EPA Postgraduate Scholarship or DCYA Growing Up in Ireland Postgraduate Scholarship. It does NOT apply to applicants for the Government of Ireland Postgraduate Scholarship.

Please outline the reasons for choosing your specific theme, including how your proposal explicitly aligns with the theme statement and specific requirements as included in the relevant appendix of the 2017 Terms and Conditions: *Max 500 words*

There is an option on the system at this point to upload any supplementary information, e.g. diagrams or bibliography, to accompany your research proposal. The system will ONLY accept supplementary material in PDF format. Supplementary material should only include essential information required for the interpretation and understanding of the proposed research, rather than additional information about the research proposal or applicant. Supplementary material will not be included in the application word count

Have you previously submitted all or part of this proposal to an Irish Research Council scheme and been unsuccessful?	
Yes	
No	☐

If yes: Please clearly describe the modifications to your research proposal since it was previously submitted:

Please note that unsuccessful applicants may only re-apply to the scheme on one subsequent occasion (with effect from 21 October 2009)

Career Training and Development Plan

Please provide a career training and development plan which addresses the following: • What are your career goals and how would this scholarship help you to achieve them? • How will you go about acquiring the expert knowledge and transferable skills necessary for your professional development, e.g. technical skills, communication skills, analytical skills? • How would this scholarship enable you to gain skills relevant to employment outside the traditional academic sector? *Max 1000 words* *PLEASE PROVIDE A CAREER TRAINING AND DEVELOPEMENT PLAN* *YOUR CAREER TRAINING AND DEVELOPMENT PLAN SHOULD ADDRESSES THE FOLLOWING*

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WHAT ARE YOUR CAREER GOALS AND HOW WOULD THIS SCHOLARSHIP HELP TO ACHIEVE THEM

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My career plan starts with attaining first class honours in my bsc if possible.

(I was lucky to be able to work as an intern (intern in the physics department) at the university, in the summer, between third and fourth year)

My career goals are to work in an exciting and up to date field in science. Neural Networks which would be my first choice. Having completed my bsc in 2018, I would like to work in research for a few years, hopefully in an exciting field such as neural networks, at the forefront of scientific discovery.

If I do not achieve a place at nuig. I will apply elsewhere.

And hopefully I will be lucky.

HOW WOULD THIS SCHOLARSHIP HELP ME ACHIEVE THESE CAREER GOALS

The Scholarship would catapult me forward. As doing a phd would give me opportunities and may lead to other exciting scientific adventures which may not have been discovered yet.

Working close with mentors at the university I could ask for guidance.

hone my skills

the academic environment is a positive place for me to cut my scientific teeth in.

to grow in.

I enjoy helping my colleges at college at present and we have interesting discussions and I am learning from them all the time too.

I would impart my knowledge. And there would be richer cross pollination of scientific ideas. Also I would feel kindly towards younger BSc students at NUIG, who needed help with tutorials.

Modern science requires team work and the synergy of a diverse spectrum of complimentary skill sets.

I want to contribute to this.

During my 3rd year summer internship I witnessed first hand collaboration between medical physicist, computational physicists, mathematicians and organizers and leaders as well as young phd students.

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HOW WILL I GO ABOUT AQUIRING THE EXPERT KNOWLEDGE.

-technical skills

-communication skills

-analytical skills.

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In my spare time I am continuing to add new computer languages to my compendium of knowledge.

I believe that problem solving requires seeing something from many angles.

The sapir-whorf conjecture suggests that the languages you use affect how you think.

Polyglotism I feel amplifies my general and problem solving intelligences.

I have completed textbooks and MOOCS IN

MATLAB

Python

Haskell

Prolog

C

Shell-Script

Linux Operating System customization.

Lisp

Prolog

The cornocopeia and history of computer languages fascinates, They all have different strengths and applications in different setting to help solve different problems.

I utilise computer programs to check calculations, perform dimensional analysis and implement new algorithms I learned in my BSc modules.

_____

Programming Experience:

I enjoy learning to program in my spare time.

My favourite programming language is currently Mathematica.

I have used it throughout this year to check calculations, perform dimensional analysis and implement all the new algorithms I learned in my Computational Physics module.

• • • • • • • • •

1. Mathematica ~

3500 hours 1000 hours 300 hours

100 hours 50 hours

2. MATLAB 3. Python 4. Haskell 5. Prolog 6.C

~ ~

~ ~

~ 50hours

mentors,

colleages,

scientific literature,

textbooks,

latest scientific articles

stack overflow,

google,

heuristic first hand exploration,

trial and error,

experimentation

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HOW WOULD THIS SCHOLARSHIP ENABLE ME TO GAIN SKILLS RELEVANT TO EMPLOYMENT OUTSIDE THE TRADITIONAL ACADEMIC SECTOR.

-technical skills

-communication skills

-analytical skills.

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Becoming an expert at writing scientific papers,

following deep research

giving me time to work in an academic setting such as nuig,

which is not always the back ground to every scientists job,

And this is important to me as its in the univeristy setting, that the exciting discoveries are made.

patronage and time are two great factors as well as an aura of teaching and learning and passing on skills.

machine learning is already used through a diverse range of industry.

it is even used in the post office to read hand writing on letters

mastery of this field would make into an employable and an excellent addition to the private sector work-force

JAMES BLACKWELL'S ANSWER

My goal is to become an expert in the area of MR thermometry and shear wave elastography. My supervisors Dr. Colgan and Prof. Destrade, are experts in MRI and elastography respectively. This gives me the unique opportunity to interact and work closely with some of Irelands leading experts in these fields. Shear wave elastography is a fast expanding area with huge potential. After I complete the PhD I want to continue my career as an academic and conduct further research in this area.

This scholarship will help me achieve my goals as it will allow me to immerse myself in novel research in an area I enjoy working in. I think that enjoying the work you do is the most important part of choosing a project, especially when things don't go to plan. I'm a self driven individual and if I'm given the necessary resources I am sure I will be able to achieve my goals.

The beauty of this project is the range of skills I will improve on. This project has distinct parts that focus on different areas of expertise.

I need to create a phantom for the scanning, I have experience in this as my 3rd year summer internship was based on creating a phantom for use in MR thermometry. I will build further on

this by testing different materials. I will gain experience in experimental testing of the mechanical properties of materials. Then I will use analytical skills to decide what is the best material to use.

I then need to investige different methods of MR thermometry that can be used, I will use my computational modelling skills to assess what is the best method to use. I will need to be able to present my findings and convey why a certain method is better than another method. This will require strong communication skills.

The planning of the experimental setup for creating the shear waves will be the hardest part of the experiment. I will need to be flexibale and adaptable in this phase as things wwill inevitably go wrong. Communicating with my supervisors about how I plan to meet my short term goals and overcome potential problems will be crucial.

Once shear waves have been created, futher analytical and modelling skills will be used for the elastography component of the project. As this is a novel area a lot of research will be taken

At the end of the scholarship I will have developed excellent skills in computational modelling, experimental physics, communication, research and data analysis. These will stand to me in my persuit of an academic position in the future.

If I decide I do not want to peruse a position in academia at the end of this scholarship, these skills are highly sought after in areas such as Reasearch & Design, medical physics or as a data analyst

Personal, Ethical and Sex/Gender Statements

Personal Statement

Please highlight any additional information which has not been included elsewhere in the application, e.g.:

- Why do you wish to pursue a higher degree by research?
- Why have you proposed this research topic?
- Why do you feel there is a specific demand for the skill set that you wish to build?
- Why are you particularly suited to this research field?

- Which of your attributes demonstrate your capability to be a good researcher, e.g. motivation, commitment, thirst for knowledge?

Max 500 words

WHY DO YOU WISH TO PERSUE A HIGHER DEGREE BY RESEARCH.

It is only by research and experiment that we as scientists can push the frontiers of progress and discovery. As a third-fourth year physics student, I am being trained extensively in using the scientific method.

I am very interested in this area of research and plan to use the skills gained during my BsC years, to the best of my ability.

Worthwhile research takes time, and careful evaluation of data and I would be so glad of the chance (opportunity) to have this exclusive phase in my life where time could be savoured, and without the additional pressures of having to do other work elsewhere.

I could dedicate myself and all my skills to a valuable cause.

Without the patronage of this scheme, I would find it very difficult to persue what has been my dream for many years.

Research by scientific method is a tried and tested way to evaluate data, which as a result gives us an idea of the likelihood of a particular hypothesis to be true or not.

RESEARCH IS THE ONLY OPTION.
RESEARCH IS THE ONLY WAY.

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-> Exoplanets and artificial intelligence are going to be important to humanity in the future.
-> Our planet may not last forever, And we may need the aid of clever algorithms to combat many problems we face in the world today.a

-> Regardless of the outcome we as human beings have always been interested in our place in the cosmos. It is the essence of being human to be curious.

-> Why should we be afraid to explore what could lie beyond the known borders of the universe.
-> Like the pit poney reared in the dark when brought up to the light can never see. There will always be people who are afraid to be educated. And to see.

-> I've always been curious in this area of science. I have been influenced by carl sagan who had this open mindedness. Away back in 1979 and I am delighted by the open mindedness of contemporaries like Elon musk who is not afraid to dream.

-> and sees endless possibilities in what some people may consider un-achievable.

-> It is the hallmark of my generation, to be computer.

-> The whole essence of university is to open up the endless possibilities imaginable in the human mind.

-> But peer-reviewed scientific research is the only thing that will carry weight no matter how fanciful I am.

-> This is why I would really like to do a PHD in my chosen field.
-> And to be handed a golden oppertunity to carry out research (In the university setting) while I am still young .

-> My grand father in the 1930s, met
}

RESEARCH RESEARCH

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-> This has never been done before

-> Automation, Mind amplification.
-> This needs to be automated at scale.

-> A new sort of microscope has been invented.
iN 1600 GALILEO HEARD ABOUT THEA NEW INVENTION OFCALLLED THE MICROSCOPE AND REPURPOSED IT TO LOOK AT
_. i WANT TO MASTER THIS NEW TOOL
->THIS WILL ALSO COMMUNICATE TO NICHOLAS
-> INTELLECTUAL ROLLARCOASTER RIDE THROUGH NAME DROPPING 400 YEARSOF SCIENCES. ;... GEOFFREY HINTON...

_>i WANT TO MASTER THIS NEW INSTRUMENT.
-> THE INSTRUMENT CAN DREAM.
}

{

If I don't get the funding I am going try and do this research anyway.

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WHY DO THINK THERE IS A SPECIFIC DEMAND FOR THE SKILL SET YOU WISH TO BUILD.

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Skill Set

-> I'll become an artist, whose palette and brushes will be alogorithms, data and experimental technique.

-> My paint will be deep neural networks.

-> The picture I will create will be an automated computer system that detects distant exoplanets.

-> During this degree I hope to master the art of neural networks and use them in all my computer programs for any task imaginable. Peter Norvig of google advocates this , and says that they should be the first tool in any developers tool box.

-> A neural network is computer programs which programs itself to do arbitrary non-trivial tasks given examples in the form of data.

-> Examples of tasks include playing, driving self driving cars,
-> pattern recognition in medical.
-> The skill set I hope to build is a highly versatile and adaptable skill which I hope will be applied ubiquitously in all domains possible. (Possibly as an aid to other medical diagnosis.)
-> This shall my golden hammer
-> This shall be the first tool in my scientists toolbox.
->

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There is a demand because this technology saves time.
TIME TIME TIME TIME TIME TIME TIME TIME TIME TIME TIME

time is of the essence when one is challenged by climate change, cancer, war.

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WHY AM I PARTICULAR SUITED TO THIS FIELD
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As Dr Leila Denmark (Pediatrician) said before she died at age 102.

(ref :: BMJ)

“Doing what you don’t like is work,” she was fond of saying. “Doing what you like is play.”

Neural Networks and Astronomy have been my hobby for the past 4 years.

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WHICH OF YOUR ATTRIBUTES DEMONSTRATE MY ABILITY TO BE A GOOD RESEARCHER?

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PATIENCE
PERSEVERANCE

DEEP INTEREST IN THIS SUBJECT
OBSESSION WITH NEURAL NETWORKS AND PROGRAMMING
STRONG INTEREST

I CARE ABOUT THIS FIELD.
I FEEL PASSIONATE ABOUT IT.
I FEEL IT.

One of my attribute is that I am an expert mathematica programmer.
I have 2300 points on stack overflow in this computer language and have collected 73 books on programming in mathematica.

I do things quickly.
I can get up early.
I have laser focus and can abstract out all unnecessary details in order to achieve my goal.
I usually get up early and am on time for work

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:Motivation
:Committment
:Thirst for Knowledge,

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((((((((((((((((((((((((((((((((()))))))))))))))))))))))))))))))))

JAMES BLACKWELLS ANSWER
While I was always interested in science and how things worked when I was younger, it wasn't until I came to NUI Galway that my passion in physics grew. I have received first class honours in all my examanations to date and have always wanted to do further research in physics.

After learning about how physics could be applied to the medical sector I asked my lecturers if I could do summer reasearch. I completed my first summer internship in medical physics in 2nd year and enjoyed it so much I got a scholarship to conduct another internship in 3rd year. During this scholarship I got the opportunity to travel to Barcelona to the annual conference of the European Society for Magnetic Resonance in Medicine & Biology and present my research there. This immersion in novel research and what so many academics are working on inspired me to do further research.

I have propsed this research topic as I think there is a genuine application at the end of it. Ultrasound elastography is starting to be used to detect tumours but the heating aspect of it hasn't been properly calculated. Further applications of high intensity ultrasound could be used to heat and destroy tumours. This would be an incredible application and greatly help peoples lives.

I think I am suited to this research field as it is an area I have had a strong interest in for a few years already and my summer internships and 4th year projects have helped put me on this path to persue a higher degree by research.

I'm a strongly self motivated individual and I want to succeed at everything I do. I don't do things by halves and if given the opportunity I am sure I will complete this project.

Ethical Statement

Does your research involve any of the following ethical issues of special relevance?	
Informed consent	
Human embryonic stem cells	
Privacy and data protection	
Use of human biological samples and data	
Research on animals	
Research in developing countries	
Dual use (possible military/terrorist application)	
None of the above	☐

Does your research proposal require approval by the relevant institutional Ethics Committee?	
Yes	
No	☐

Please note that a full ethical report and approval from the relevant institutional Ethics Committee should be received by the Council before activities for which ethical approval are required commence or no later than three months after the start date of the scholarship

Please provide a statement detailing the careful consideration you have given to the ethical implications of the proposed research (where ethical issues may arise) and how you plan address these over the course of your scholarship:

Max 500 words

Sex/Gender Dimension Statement

Does your research involve any of the following?	
Humans as the research focus	☐
Animals as the research focus	☐
Human samples and/or data	☐
Humans involved as consumers, users, patients, or in trials	☐
Research on animals, animal samples and/or data	☐
Research outputs with implications for end users or consumers	☐

Please provide a statement detailing whether there is a potential sex/gender dimension to be considered in carrying out your research. If your research involves any of the above, please indicate how potential sex/gender issues will be handled. In particular, you are asked to reference the points mentioned in the 'checklist for sex/gender in research content' in the Guide for Applicants: *Max 500 words*

Please carefully read the section on *sex/gender dimension* in the Guide for Applicants for help in answering this question

Financial Justification

- Please provide the total cost for the full duration of the scholarship.
- The exact amount of eligible direct research expenses to be allocated is subject to sufficient justification being made. An itemised breakdown of costs is required, e.g. separately list the cost and justification for individual pieces of computer equipment and software. Small consumables can be grouped as one item, e.g. general lab or stationery supplies.
- Software and hardware must be obtained within the first year of a scholarship or within the first three months of a 12-month award. Aside from this exception, funds may not be used to purchase capital items.
- A maximum amount of €2,250 *per annum* applies.
- There is a limit of €1,000 for computers or laptops.
- Membership costs are not eligible.
- Living costs, e.g. rent, are not essential direct research expenes and should not be included.
- Subsistence/per diem/meal costs/vouched expenses for meals and drinks are not an eligible cost.

Essential direct research expenses:	**Total cost requested for the funding term:**	**Please provide a full justification and itemised breakdown for all costs requested:**
Essential research supplies such as small consumables:		
Pay-as-you-go access to national research infrastructure:		
Software and hardware critical for the proposed research:		
Archival research costs:		
Conference travel and participation:		
Generic and/or specialist disciplinary skills training:		
Publishing and write-up costs:		
Other costs:		
Total:		

Applicant Declaration

I hereby declare that I have read and accept the applicant requirements as set out in the 2017 Terms and Conditions and Guide for Applicants on the Irish Research Council website:

I agree	☐

I confirm that the information supplied in this application is correct and recognise that should it become apparent that any of the information provided is inaccurate or unverifiable with appropriate documentation, it will result in the application automatically being deemed ineligible:
I agree ☐

I hereby declare that this application is my own work and understand that it will be subject to plagiarism checks:
I agree ☐

Would you like the Irish Research Council to make your application available to other funding agencies and/or enterprise partners for consideration?
Yes ☐
No