

Oracle Cloud Credits for Researchers—Application Form

Oracle for Research partners with researchers and university entrepreneurs to find solutions to humankind’s complex, disruptive, and high-impact social, environmental, economic, and technical challenges, bringing about positive, transformational change in the world. Through the Oracle for Research program, Oracle grants Oracle Cloud credits to accelerate research and discovery.

- Researchers must apply for and have their projects accepted by Oracle for Research to receive Oracle Cloud credits.
- Oracle Cloud credits may be used for more than thirty (30) Oracle Cloud Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) [products](#), based on general availability at the time the Oracle Cloud credits are used
- Awarded Oracle Cloud credit amounts will vary depending on the proposal and usage requirements documented in the application form.
- Researchers who receive Oracle Cloud credits will have use of Oracle Support services during the one-year Oracle Cloud credit term.
- See terms and conditions detailed in the Oracle [Cloud Services Agreement](#).

To be considered, please complete this form and submit it by email along with a copy of the PI’s CV to OracleForResearch_ww@oracle.com:

<i>First name and last name of PI:</i>	Dr. Jean Ettics
<i>PI’s job title:</i>	Professor, Department of Neuroscience
<i>PI’s university email address:</i>	Jean.ettics@csu.edu
<i>Academic institution of primary investigator (PI):</i>	Cloud State University
<i>Address of academic institution (including street address, city, state/province, country, and mail/zip code):</i>	1852 Cajal Street, Redwood City, California 94059

<i>Name and position of the researcher conducting the work on this project:</i>	Dr. Hodgkin Huxley, Postdoctoral Research Fellow
<i>Partner academic or industry institutions collaborating on the research (if any):</i>	The Nernst Institute of Neuroscience
<i>Name and role of any existing Oracle contacts:</i>	Bryan Barker Research Advocate
<i>Primary technical contact name (first and last) (who will own and administer the Oracle Cloud tenancy):</i>	Dr. Rosa Lin Franklin
<i>Primary technical contact's job title:</i>	Professor, Department of Genetics
<i>Primary technical contact's university email address:</i>	Rosa.franklin@dna.csu.edu
<i>Legal Signature Authority (LSA) name (first and last) (who will receive the quote and agree to the contract terms on behalf of the academic institution):</i>	Charlie D. Win
<i>LSA's university email address:</i>	Charlie.win@csu.edu

- **Research project name:**

Understanding and Detecting Sudden Unexpected Death in Epilepsy (SUDEP) in *SCN8A* Encephalopathy

- **Research description and public relevance:**

SCN8A encephalopathy is a rare and devastating neurological disorder that arises from *de novo*, gain-of-function mutations in the *SCN8A* gene. The *SCN8A* gene encodes

for the voltage-gated sodium channel isoform $Na_v1.6$, a protein that is found throughout the body with an abundance of expression found in the central nervous system (CNS). In *SCN8A* encephalopathy, gain-of-functions in the *SCN8A* gene result in hyperexcitability of $Na_v1.6$ channels. The results of these gain-of-function mutations in *SCN8A* encephalopathy are devastating to patients given the prevalence of $Na_v1.6$ throughout the body. Patients develop seizure onset between 0-18 months of age and these seizures are often refractory to treatment. Additionally, patients often suffer from severe cognitive impairments, developmental delay, GI/respiratory dysfunction, and mild to severe motor disorder. Sudden unexpected death in epilepsy (SUDEP) is also prevalent in approximately 10% of *SCN8A* patients.

Our understanding of SUDEP in *SCN8A* encephalopathy is currently inadequate. Using EEG recordings from a mouse model of *SCN8A* encephalopathy, we aim to analyse seizures in our mice over time with a novel machine learning algorithm created in our lab. Our goals will be to try to better understand when and why SUDEP occurs in our mouse model and if any current or experimental antiepileptic medications can prevent or delay this event from occurring. First, we will use previous EEG recordings to train our machine learning models to detect and analyse spontaneous seizures in our *SCN8A* mouse model. Our machine learning algorithms will annotate on our files when a seizure occurs, and it will also provide a power spectrum analysis of the ictal event. In addition to our EEG data, our novel algorithm will also incorporate data from MouseTrakr software to study changes in a mouse's behaviour in conjunction with alterations in seizure activity leading up to SUDEP.

Once training is complete, we will compare the seizure progression and behavior in animals who did and did not suffer from SUDEP. We hope these experiments will highlight key differences between these two experimental groups and provide definitive warnings, whether EEG or behaviourally, that SUDEP may occur in a mouse.

In the last part of the project, we aim to determine if approved or experimental antiepileptic drugs, administered at the early signs of progression towards SUDEP, can delay or prevent the event from occurring. Our automated EEG analysis system will also help detect how these various therapies alter seizure frequency and power. If successful, we believe our experiments will help determine when and what treatment an animal should receive to prevent the occurrence of SUDEP.

- **Research aims and key project milestones (Please provide at least 4 project milestones, including approximate completion dates):**

Milestone 1: Migrate the Ettics's lab EEG database to Oracle Cloud and get acclimated to using OCI (January-March)

Milestone 2: Train our novel machine learning algorithms on previous EEG and MouseTrakr data from control and *SCN8A* mice (April-June)

Milestone 3: Use our machine learning algorithm to predict the probability of SUDEP in SCN&A mice in real time using EEG and MouseTrakr data (July-September)

Milestone 4: Observe how approved and experimental antiepileptic drugs alter seizure frequency and power spectrum. Gather evidence for which drugs are most successful at delaying or preventing SUDEP. (October-December)

- **Anticipated computing infrastructure requirements (e.g. storage, compute, networking needs) and Oracle Cloud services to be used:**

- 1) Storage
 - a. 10 TB of Storage
 - b. 12 Months (Data will be stored throughout the length of the project)
- 2) Oracle Cloud's Virtual Machines and GPUs (for 12 months use)

Service	Unit	Specific	Hour Per Month
Developmental Resources			
Development VMs	3x	VM.Standard.E2.4	700
GPU Research Shapes			
1. GPU Shape	1x	VM.GPU2.1	300
2. GPU Shape	2x	VM.GPU.3.1	100
3. GPU Shape	1x	VM.GPU.3.2	150

Field of research (select one):

- Advanced engineering (for example, aerospace, automotive, civil, manufacturing)
- Agricultural sciences
- Artificial intelligence and machine learning
- Cognitive and behavioural sciences
- Environmental and earth sciences (for example, climate studies, ecology, geology, geography, meteorology)
- Energy (for example, oil and gas, alternative fuels, utilities)
- Life sciences (for example, healthcare/medical and pharmaceutical)**
- Physical sciences (for example, physics, chemistry, astronomy)
- Social Sciences (for example, anthropology, economics, jurisprudence, political science, sociology)
- Other – please specify:

- **Does your research project have external funding sources? If yes, please specify duration, source and funding amount:**

Yes, this project is funded for two years at \$250k/per year by the Academy of Epilepsy Research.

- **Will your research result in a published peer-reviewed scientific paper or papers? If yes, please specify the publication timeframe and journals you intend to target:**

Yes, we anticipate that this project will result in two peer-review scientific papers. Potential journals to target will be *Epilepsia*, *Journal of Neuroscience*, and *Brain*.

- **Have you used cloud infrastructure for your research in the past? If yes, please share vendor / platform name:**

Yes, we are familiar with cloud infrastructure platforms and have experience with Microsoft and Rainforest Cloud services.

- **Do you have cloud services or databases that need to be migrated to Oracle Cloud?**

Yes, we need to migrate our EEG database to Oracle Cloud.

- **Do you anticipate needing technical support to transition and conduct your research on Oracle Cloud? If yes, please describe the type and frequency of support you may require.**

We anticipate needing initial support acclimating the OCI environment and minimal sporadic support at intervals throughout the duration of the project.

- **Are you aware of any ongoing sales transactions between Oracle and your institution?**

No, we are not aware of any pending sales transactions.

- **Will you be able to share benchmark data with Oracle as part of this research (for example, comparing Oracle's cloud infrastructure with on-premises or an alternative cloud infrastructure)?**

Yes, we are willing and able to share benchmark data with Oracle.

- **Will you share details for publication about your use of Oracle Cloud in your research?**

Yes, we will provide details of our publications to Oracle and send PDFs of our published manuscripts.

Outreach initiatives within the academic community are both valuable and appreciated by the Oracle for Research team. Please select all options that apply to you:

- ✓ I am willing to act as a reference for future customers
- ✓ I am willing to be featured as an Oracle for Research case study
- ✓ I am willing to discuss my Oracle collaboration at internal seminars (if applicable)
- ✓ I am willing to discuss my Oracle collaboration at external meetings
- ✓ I am willing to act as a collaborator or learning resource to other OfR Participants