***Please remove this page when submitting your application***

| ***Important note:*** *Remember to fill in the online application form with all your requests. There should be no discrepancies between requests in this document and the online form. Failing to include ALL your requests in the online application form might impact your final allocation, if your application is successful. In case of discrepancy, the online form will prevail.* |
| --- |

***Purpose of this Document***

*This application document will be reviewed by a committee made up of your peers (i.e. Canadian faculty members with expertise in the subject area) following the review criteria available in the* [*application guide*](https://alliancecan.ca/en/services/advanced-research-computing/accessing-resources/resource-allocation-competitions/resource-allocation-competition-application-guide)*. It will also be reviewed by technical staff of the Federation to ensure that the resources requested will be used appropriately and efficiently.*

***General Presentation***

*The document must have this format:*

* ***Maximum of 8 pages (before References and the Appendix)****.* ***Page limits will be enforced****;* ***any information after page 8 (except for References and the Appendix, when applicable) will be ignored.*** *Note: It is not required to use the maximum page limits to be successful: applications asking for a small amount of resources may need fewer pages: what matters is the quality, not the quantity, of the information provided.*
* *Letter paper size (8½ x 11 inches)*
* *Minimum of 2 cm margins on all sides.*
* *Font in Times New Roman (12 pts or more) or Arial (11 pts or more).*
* *Header on all pages includes the title of the project and the name of the PI.*
* *All pages numbered consecutively.*

***Submission***

* ***Please remove all text in italics.***
* *This document must be submitted* ***in pdf format only.***
* *Please consult the* [*Technical Glossary*](https://docs.alliancecan.ca/wiki/Technical_glossary_for_the_resource_allocation_competitions)*.*

***Evaluation Criteria***

**Research Methods: 70%** *(max 6 pages)*

* *Research Outline*
* *Expected Outcomes*
* *Progress Over the Past Year*
* *Computational Methods*
* *Resource Request Justification*

**Resource Management and Computational Expertise: 30%** *(max 2 pages)*

* *Funding*
* *Computational Expertise of the Team*
* *Management Strategy*

***2023 Resources for Research Groups Application Template***

*The most effective applications directly address the questions that matter most in this competition: what is going to be computed, why, and how, as well as why large-scale CPU, memory and/or other resources requested are critical for the success of the* ***computational*** *project(s).*

**Research Methods** *(max 6 pages)*

**1. Research Outline** *(suggested 1 page)*

***Focus on what research will be done, not on why it is important.*** *Outline the research problem for which computational resources are being requested. Outline the overall research goal and objectives, clearly stating what the computational project(s) is ultimately expected to achieve.*

**2. Expected Outcomes** *(suggested ½ page)*

*Describe the expected outcomes (i.e. the anticipated results), indicating the means by which they will be measured and explaining how they align with the research objectives. Also describe the proposed computational project outputs (i.e. the anticipated products or activities of the project). Briefly explain how the proposed computational project(s) will lead to advances in the research area.*

**3. Progress Over the Past Year***(suggested ½ page)*

*Highlight any notable research that you have performed with the use of computational resources provided by the Federation. This may be linked to a publication in your CCV publication record, or it may be a work in progress.*

**4. Computational Methods** *(suggested ½ page)*

*Describe appropriate tools, methods and approaches for addressing the research objectives. These methodologies may be community codes or models, data analysis methods, or algorithmic formulations expressed in user-developed scripts or tools. If applicable, provide justification for the number of samples proposed in the computational project(s). If trials or test implementations will be carried out, please provide details here.*

**5. Resource Request Justification** *(suggested 3 ½ pages)*

*This section addresses the technical details of your computational, storage or cloud needs.* ***Complete only the sections that are applicable to the resources you are requesting****. If you do not understand the technical questions or need help benchmarking your code, contact* *allocations@tech.alliancecan.ca*

**5.1 Resource Request Summary**

*Please summarize your request here and then provide a detailed justification in the next sections. Feel free to modify the table as needed.*

| *Important note: Remember to fill in the online application form with all your requests. There should be no discrepancies between requests in this document and the online form. Failing to include ALL your requests in the online application form might impact your final allocation, if your application is successful. In case of discrepancy, the online form will prevail.* |
| --- |

| ***Project*** | *Project 1* | *Project 2* | **Totals** |
| --- | --- | --- | --- |
| **Team members** | *2* | *2* | *4* |
| **Core years** | *200* | *40* | *240* |
| **GPU years** | *3.42* | *0.44* | *4* |
| **/project (TB)\*** | *100* | *100* | *200* |
| **/nearline (TB)\*** | *100* | *100* | *200* |
| **dCache (TB)\*** |  |  |  |
| **VCPU Compute Cloud**  |  |  |  |
| **VGPU Compute Cloud**  |  |  |  |
| **VCPU Persistent Cloud**  |  |  |  |
| **Cloud Volume and Snapshot Storage (GB)\*** |  |  |  |
| **Cloud Object Storage (TB)** |  |  |  |
| **Cloud Shared Filesystem Storage (TB)** |  |  |  |

*\*The amount of storage requested must include any storage allocation or data that you may currently have in a cluster PLUS any additional storage needed.*

**5.2 Compute Requests in the Clusters** *(complete if applicable)*

**5.2.1 System Selection**

*Provide reasoning for your choice of system(s). If possible, mention other systems that might also meet your needs. See the* [*list of resources available*](https://alliancecan.ca/en/services/advanced-research-computing/accessing-resources/resource-allocation-competitions/available-resources)*.*

**5.2.2 Size of Compute Request**

*Explain your computing needs and how you estimated the total amount of compute time required for this project. Download and use this spreadsheet (*[*Excel*](https://docs.google.com/spreadsheets/d/1kgaK-gl44ZIqMtdgoLXJeBj_dNt4tYfa/edit#gid=278446953) *or* [*Open Document*](https://drive.google.com/drive/folders/1ApbiXPjanSQdMxhIPMuFwpbvAPcYRaai) *format) to calculate the amount of compute resources needed and include the results of your calculations.*

*For jobs NOT using GPUs*

|  | **Number of cores per job** | **Memory per core (GB)** | **Number of jobs to run** | **Duration of each job in hours** | **Core years requested** |
| --- | --- | --- | --- | --- | --- |
| 1 | *8* | *4* | *10000* | *22* | *200.78* |
| 2 | *1024* | *8* | *2* | *168* | *39.25* |
| 3 |  |  |  |  | *0.00* |
| **Total** | ***240*** |

*For jobs using GPUs*

|  | **GPU architecture** | **Number of GPUs per job** | **Number of CPU cores per GPU** | **System memory per GPU (GB)** | **Number of jobs to run** | **Duration of each job in hours** | **GPU years requested** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | *A100+32-GB* | *10* | *20* | *16* | *1000* | *3* | *3.42* |
| 2 | *V100* | *1* | *16* | *4* | *100* | *24* | *0.27* |
| 3 | *No preference* | *4* | *16* | *50* | *10* | *36* | *0.16* |
| **Total** | *3.86* |

*For reference, the different ratios of GPU:CPU Cores:System-memory are listed* [*here*](https://docs.alliancecan.ca/wiki/Allocations_and_compute_scheduling#Ratios:_GPU_.2F_CPU_Cores_.2F_System-memory)*.*

*If you have specific constraints about GPU architectures or types, please justify it here. For example, "to run my calculations, I need a double precision GPU and 32 GB of GPU RAM for my model".*

**5.2.3 Memory Requirements**

*Please read about* [*Allocations and compute scheduling*](https://docs.alliancecan.ca/wiki/Allocations_and_compute_scheduling) *before completing this section. If you don't know how to calculate your memory requirements or have questions, please contact* *allocations@tech.alliancecan.ca**.*

*In the online form, you must specify system memory requirements. If there is any additional information not already included in the online form, please include it here (e.g., a typical job script for the biggest job that you would be running). This information is useful to know which system is appropriate for your type of jobs and how many resources your jobs will use.*

*For example:*

#!/bin/bash

#SBATCH --ntasks=4

#SBATCH --mem-per-cpu=12000 # Default units are in MB

#SBATCH --time=1-00:06 # One day and 6 minutes

#SBATCH --account=def-user-ab

*Jobs that use more than the average of 4 GB per core are charged accordingly. Please describe why you need more than 4 GB per core for some of your projects, and why the software cannot use more cores in parallel with 4 GB per core.*

**5.2.4 Software Details**

*Provide details about the commercial, open source or home grown codes (e.g. name, key reference publication, essential numerical methods used, whether it is serial/parallel, the type of parallelism [if any], etc).*

**5.2.5 Code Performance and Utilization**

*Discuss code performance (e.g. how many iterations/timesteps/operations per hour of wall­clock time and the type of system used for this measure, how much RAM is required per job/process, etc.) and whether there are particular systems or processor architectures for which the code is best suited.*

*In the case of parallel codes, please discuss scaling efficiency and justify (in terms of performance) the typical job sizes you will run.* ***A detailed description of scaling efficiency is required if parallel jobs will use 256 cores or more and is preferred even for smaller jobs sizes.*** *(Cycles can be made available for this type of code performance testing).*

**5.2.6 I/O Requirements**

*Discuss numbers and sizes of files expected to be produced per job. How much of the resulting data needs to be kept on the system longer than 2­-3 weeks (e.g. longer than for simple post­-processing)? Also indicate how much Scratch storage will be required for actually running your jobs (not for storing/archiving results).* *Is checkpoint restart implemented?*

**5.3 Storage Requests in the Clusters** *(complete if applicable)*

***The amount of storage requested must include any storage allocation or existing data that you may currently have in a cluster PLUS any new, additional storage needed. For example, if you are currently using 50 TB of storage in a cluster and need an additional 50 TB, then the request should be for the total amount, 100 TB.***

**5.3.1 Storage Details**

*Explain why a storage allocation is required as opposed to making use of scratch or other space made available by the Federation for running jobs. Is the allocation being requested in order to store codes and data files (this would be typical of many requests) or are there additional special requirements (e.g. for databases, web ­access, availability from multiple sites/systems etc)? Roughly how many individual files will be stored and what is their size distribution?*

*State whether the data being stored must be directly accessible by running jobs, or if it can be on a remote network accessible server. Indicate if the data being stored is the only copy of the data that exists and state what would be required in order to regenerate the data if it was lost. Does this data need to be backed­ up by the site?*

**5.3.2 Storage Performance and Utilization**

*Will storage requirements vary during the year (e.g. will all requested storage be needed immediately in April or can the allocation grow/vary during the year)? Will the storage allocation be required to persist into the following year? Is storage performance (e.g. bandwidth and IOPS) critical to the project and, if so, what estimated I/O and IOPS rates are required and why?*

*Are you using data compression? If not, is compression possible?*

*The Federation provides several types of storage. Many long-term storage needs can be met by tape at much lower cost than disk. Tape is still accessible on a short-timescale and is suitable for data that is not being very frequently accessed.* ***If you know that you cannot use tape storage for your longer-term needs, please explain why.***

**5.4 Cloud Requests** *(complete if applicable)*

*Please provide details supporting the cloud request summarized in section 5.1. We suggest including a breakdown according to use or service as illustrated below, but we understand that each project can be very unique. For more information about the cloud sites, read the* [*Cloud documentation*](https://docs.alliancecan.ca/wiki/Cloud)*.*

*Note:*

* *If you request persistent instances and the primary purpose of the allocation request is to operate a web portal/platform, you should consider submitting an application to the Research Platforms and Portals competition instead.*
* *If you request VGPUs, please justify why you cannot use GPUs in the general purpose clusters.*
* *The cloud has several different* [*storage options*](https://docs.alliancecan.ca/wiki/Cloud_storage_options)*. Please explain why you are selecting a specific cloud storage option.*

*Feel free to modify the table below based on the specific needs of your project.*

| **Use** | **Number of instances** | **Size of instances**  | **Cloud storage** | **Network** |
| --- | --- | --- | --- | --- |
| *Web Front-end* | *2* | * *2 cores*
* *4 GB RAM*
 | *100 GB persistent for temporary data.* | *2 external IPs* |
| *Back-end compute* | *4* | * *16 cores*
* *60 GB RAM*
* *for incoming data analysis*
 | *1 TB local ephemeral* | *Internal*  |
| *Database #1* | *1* | * *4 cores*
* *16 GB RAM*
 | *500 GB persistent* | *Internal*  |
| *Shared storage* | *0* |  | *20 TB shared storage* | *Internal* |
| *Object Storage* | *0* |  | *20 TB object storage* | *Internal* |
| *Etc.* |  |  |  |  |

**5.5 Description of High Demand Periods (if applicable)**

**Resource Management and Computational Expertise** *(max 2 pages)*

*This section is mandatory for ALL applications. This criterion evaluates the capacity of the research team as a whole to manage the computational project and make efficient use of the computational resources requested. It also assesses the overall feasibility of the computational project based on the research and computational expertise of the team. The team includes the Principal Investigator (PI) and, if applicable, co-PIs and any Highly Qualified Personnel (HQP)* ***actively*** *participating in the computational project. The level of detail needed to get a high score for the* Resource Management and Computational Expertise *depends on the size of the team and the amount of computational resources requested.*

*If you, as the PI of an application, are also participating as a co-PI of one or several other applications for the current Resource Allocation Competition, please mention here the full name of the PI and the project title of each application in which you are listed as a co-PI.*

**6. Funding Available to Use Advanced Research Computing Resources**

*Provide details of any funding available to* ***directly*** *support the project(s) requesting computational resources provided by the Federation in this application. Important: It is expected that applications asking for large amounts of computational resources will have funding to justify the request. Please make sure that any funding reported in this section is in your CCV; if that is not possible, please explain why.*

*If* ***no*** *funding is available, explain how the project will be resourced and the computational resources requested will be used.*

*When applicable, please include a table like the one below.*

| ***Projects*** | ***Funding source*** | ***Grant*** | ***Grant start date*** | ***Grant expiry date*** | ***Total grant award***  | ***Portion allocated for computational project(s)***  |
| --- | --- | --- | --- | --- | --- | --- |
| *Project 1* | *NSERC* | *Discovery Grant* | *01-01-2010* | *07-01-2024* | *CAD $250,000* | *CAD $50,000* |
| *Project 2* | *Regional funder* | *Provincial Grant* | *06-15-2008* | *03-31-2023* | *CAD $50,000* | *CAD $20,000* |
|  | *Total* | *2 grants* |  |  | *CAD $300,000* | *CAD $70,000* |

**7. Computational Expertise of the Team**

*Describe the level of confidence, experience and expertise of your research team in using the computational methods proposed, as well as the different resources (e.g., CPU, GPU, storage, cloud, etc.) requested. If the team does not have experience using computational resources, please provide a training plan.*

*(Optional)*

| ***Required Expertise*** | ***Description of internal or planned resources*** |
| --- | --- |
| *eg) Machine learning* | *New post-doc position currently being filled.* |
| *eg) Parallel programming* | *Provided by SciNet analysts* |
| *eg) Optimization* | *Extensive experience with using Federation resources.* |
| *...* | *...* |

**8. Management Strategy** *(required).*

*Describe how the team will be managed to make efficient use of the computational resources requested and achieve project objectives.* ***Clearly explain the role and contribution of each Co-PI (if applicable) to the project.***

***Project 1: [title]***

| ***Name*** | ***Position*** | ***Core years*** | ***GPU years*** | ***/project (TB)*** | ***/nearline (TB)*** |
| --- | --- | --- | --- | --- | --- |
| *Full name 1\**  | *Eg. Team lead* | *100* | *10* | *50* | *50* |
| *Full name 2*  | *Position 2* | *100* | *0* | *50* | *50* |
| ***Totals*** | ***2 team members*** | ***200*** | ***10*** | ***100*** | ***100*** |

*\*Use "Student" if the position is still to be filled and you do not yet know the name.*

***Project 2: [title]***

| ***Name*** | ***Position*** | ***Core years*** | ***GPU years*** | ***/project (TB)*** | ***/nearline (TB)*** |
| --- | --- | --- | --- | --- | --- |
| *Full name 3*  | *Position 3* | *80* | *10* | *50* | *50* |
| *Full name 4*  | *Position 4* | *100* | *0* | *50* | *50* |
| ***Totals*** | ***2 team members*** | ***180*** | ***10*** | ***100*** | ***100*** |

*-------------------- Anything below this line does not count for the maximum page limit----------------------*

**References** *(if applicable)*