

RESEARCH ASSISTANT OPPORTUNITIES – Open Call from Dr. Maiga Chang

Dear students,

I would like to make you aware of the research assistantship opportunities that are currently available in my research group (i.e., VIP Research Group, see research outcome at <https://maiga.athabascau.ca/#outcome> as well as <https://www.youtube.com/@vipresearchgroup>). Successful candidates will be working on the projects under the supervision of Prof. Maiga CHANG (<https://maiga.athabascau.ca/>) at Athabasca University.

- Start Date: As soon as possible
- Term: 3- or 4-month term
- Workload: The positions are part-time research assistantship. Depending on your availability, you can do 0 (zero) hour to maximum 15 hours per week for working (sub-)tasks. You will need to upload a hour-task done text file to the project's BitBucket repository.
- Rate: The payment is \$17.51 per hour basic, which equates to about \$20.09 per hour including CPP and EI.
- Location: You can do the tasks remotely from anywhere in Canada.

Qualifications:

For doing this project, the student is better to have the following skills/knowledge and better to have some experiences on:

- Familiar with JSON, HTML, CSS, and AJAX.
- Familiar with PHP.
- Familiar with Python.
- Familiar with Git commands.
- Familiar with client-side (browser side) JavaScript development WITHOUT the use of jQuery and other frameworks.
- Familiar with using browser side JavaScript to access a backend web page in PHP via AJAX and pass data in JSON format.
- Familiar with MySQL/MariaDB and SQL commands.
- Information collection, re-organization, summarization, and reports.
- Using screen capture software and video editing software/tool to create instructional video clips in mp4 format.
- [Asset] Having knowledge and experience on Neural Networks programming in Python.
- [Asset] Having knowledge and experience on Regular Grammar.
- [Asset] Having experience in Network Socket and/or WebSocket programming in Python.
- [Asset] Familiar with JavaScript library for producing dynamic, interactive data visualizations in web browsers (e.g., D3.js).
- [Asset] Having experience in using BitBucket/GitHub Repository.
- [Asset] Having experience in using Natural Language Processing library (NLTK) with Python.



- [Asset] Having experience in doing time-series/sequential data mining, pattern extraction/recognition, clustering with Python.
- [Asset] Having experience in developing Python standalone application (acts as startup daemons running via cron job in Ubuntu).

*****Important notes*****

1. Open until filled.
2. All applicants are thanked for their interest in this position; however, only candidates selected for an interview will be contacted.
3. Selected candidates will be invited for an interview that will be scheduled via online with Microsoft Teams @ <https://meeting.vipresearchgroup.ca> until the position is filled.
4. For interview, please prepare a very short presentation (and live demonstration what you have done before, if applies) to show the required skills you have, e.g., showing the works/codes you have done before.

How to apply:

Qualified individuals are encouraged to submit their application by email to Dr. Maiga CHANG (maigac@athabascau.ca). The application should include:

1. a cover letter that indicates the potential research project(s) you would like to apply for and summarizes your skills, interests and experience;
2. a current resume or curriculum vitae;
3. an unofficial copy of your transcript, and
4. the contact information for 2 references.

The call will be kept open until successful candidates are found.

Research Projects:

- **Adopting ICER Autobot in MEGA World**
(research areas: game-based learning, learning analytics, software development, human computer interaction, and visualization)
 - Current ICER video can be found at Trading Card Game playlist in VIP Research Group's YouTube channel (<https://www.youtube.com/@vipresearchgroup/playlists>)
 - ICER Web Management UI - How teachers manage rewards?
(<https://www.youtube.com/watch?v=dBSdI67MaK8>)
 - ICER Web - How learners redeem the in-game card reward?
(<https://www.youtube.com/watch?v=9I0i2GFjVo0>)
 - ICER Autobot was developed in PHP
 - MEGA World was developed in PHP
- **Card Forge Workshop for TCG**
(research areas: game-based learning, learning analytics, software development, human computer interaction, and visualization)
 - With the two constraints — (1) not changing existing database schema and (2) making sure the current game-play engine/scripts can still work.
 - Players can upgrade their cards with same card at same or different star ones — the rules and success probability may need to analyze and design thoughtfully



- Players can merge avatar card with magic/trap card to enhance their avatar card by giving them extra values according to what magic/trap card they use — what kind of supplemental cards the forge may need, how the attribute and value can be forged into an avatar card, and the success probability need to analyze and design thoughtfully
- **Virtual Players and Their Dashboard in TCG** — Adopting 5-Component Chatbot Mechanism and Google Gemini
 - 5-Component Chatbot Mechanism was developed in Python
 - Using Google Gemini API with Python
 - Virtual Players can chat with players as well as play matches with players
- **Improvements of Ask4Summary – An Automatic Text Summarization Service**
 - Re-design the dashboard and implement necessary functions with new parameter settings for selected courses by adopting the use of text-based configuration PHP pages.
 - Enhancing and refining the speech-to-text and OCR functions that are capable of processing and converting uploaded materials behind in periodical, reliable, and interruptible/resume-able way.
 - Implementing topic modeling and entity extraction functions that are capable of grouping text-based paragraphs behind in periodical, reliable, and interruptible/resume-able way as well as improve the summary generation algorithm to speed up the generation process.
- **Key Phrases Extraction for Writing Recommendations and Better Answering User's Question**

(research areas: natural language processing, artificial intelligence, neural networks, pattern recognition, generative pre-trained transformers, text generation, software development)

 - Creating, training, and testing a Neural Network for word prediction and next word candidate finder with selected methods and large language models (e.g., Ski-gram, CBOW, RoBERTa, etc.) with full text documents.
 - Developing a web-based Dashboard that shows neural network training stats including the neural network structure, training dataset, time spent, epochs and the training progress (e.g., accuracy, loss, etc.) and testing results (e.g., test dataset, precision/recall, and f-measure), as well as allows visitors to download last-night version of the trained model.
 - Improving Valid N-gram Verifier web-based service (<https://ngrampos.vipresearch.ca>) that takes request and sends response in JSON format.
 - Developing a communication bridge between Valid N-gram Verifier and GPTs (e.g., GPT 3, 3.5, and 4) applications for obtaining writing recommendations.
 - Revising Try It web user interface (as well as How to Access instruction) for users to enter a text, select min and max n value that they want the system to identify valid n-grams from the entered text, and see the identified valid n-grams from (n-1)-grams and the potential correspondent predicted n-grams in hierarchical view, as well as the writing recommendation.
- **Developing Moodle Plugins for Existing NLP/Chatbot Research Outcome**

(research areas: natural language processing, artificial intelligence, neural networks, software development)



- Developing and implementing the correspondent functions (in PHP) that can assign license key for a registered user as well as when the user registers an account at Authorship Forensic Portal; provides a list of available public models as well as the models belong to a license key (if provided) in JSON; and, receives the recognition job request package in JSON format.
- **Developing Mobile Apps and Browser Plugins for Existing NLP/Chatbot Research Outcome with Android Studio and WebView**
(research areas: natural language processing, artificial intelligence, neural networks, software development)
 - Developing and implementing PHP pages (UI and non-UI) with AJAX/CSS/HTML for adopting existing NLP/Chatbot research outcome (e.g., ChatbotLLM, VEE, 5-Component Chatbot, Ask4Summary, Authorship Forensics, MEGA World Speaking-based Quest, MEGA World Guardian, TCG Virtual Player, etc.).
 - Developing and publishing mobile app on VIP Research Group's Google Play store with Android Studio and WebView to use the implemented PHP pages so users can access existing research outcome from their Android devices.
- **Multi-user and multi-chatbot**
(research areas: natural language processing, artificial intelligence, software development)
 - Revamping the existing web-based multi-user chatroom (i.e., the platform) with the implementation of Python-based WebSocket server.
 - Designing and developing search filters (e.g., date, period, user, word string/combinations, emotions, chatbot flag, etc.) and statistics (e.g., user/chatbot action sequences, interactions, frequencies, co-presenting, etc.).
 - Revamping the process and functions of designing and developing chatbot developer's and their chatbot registration function as well as service entry points (in PHP) for chatbot to access the platform and emulate human user's behaviours.
 - Implementing demo chatbots with the Python-based 5-Component Chatbot (i.e., communicating, listening, processing/filtering, saving/retrieving info from memory, and talking) framework so future chatbot developers can adopt and extend.
- **Chatbot Creation Workspace with 5-Component Chatbot Framework**
(research areas: natural language processing, artificial intelligence, software development)
 - Users/Developers can review and upload chatbot components in .py (i.e., communicating, listening, processing/filtering, saving/retrieving info from memory, and talking), assemble and configure their own chatbot via intuitive interaction way (i.e., drag and drop components into workplace).
 - Functions like email verification with an activation link, registered email address changing, chatbot project creation, saving, and opening.
 - Workspace that has Component Panel (with five tabs and each is for a component), Workplace Panel (with design stage and code review tabs), Property Page Panel (showing and allowing users to see and update values of properties for the chatbot project and selected components), Build & Download button (generate shell .sh scripts for Linux and .bat scripts for Windows that execute and stop the chatbot; pack the



chosen .py script with the .sh and .bat files into a zip file; and, then start the file download process when users/developers click it)

- **Sequential behaviour patterns extraction, grouping, and similarity calculation** (research areas: sequential data mining, pattern extraction, recommendation, software development)
 - Identify the behavior such as walking, running, driving (take bus and subway OR driving) based on sequential data logged.
 - Designing and implementing time-series/sequential pattern extraction algorithm.
 - Designing and implementing pattern similarity calculation algorithm.
 - Designing and implementing pattern clustering/grouping algorithm based on patterns' similarity.
 - Designing and implementing recommendation algorithm for individuals based on their time-series/sequential patterns and the common pattern of the group/cluster they belong to.

Athabasca University and the researchers are committed and seek to support equity in employment and research opportunities. We strongly encourage applications from Indigenous people, people of colour, people with disabilities, 2SLGBTQ+ people, women, and other historically marginalized groups. Applicants are welcome, but not required, to self-identify in their letter of application.

For more information on this Research Assistant Opportunity, please contact Dr. Maiga CHANG at maigac@athabascau.ca.