**Scope of computational Linguistics in the field of Artificial Intelligence (Highly demanded field of AI)**

***Dr. Ashish Kumar Pandey***

Computational linguists evolve computer systems to facilitate with human language. They need a good understanding of both programming and linguistics. This is a challenging and technical field, but skilled computational linguists are in demand and highly paid. Computational linguists build systems that can perform tasks such as speech recognition, speech synthesis, machine translation, grammar checking, grammar sketching, text mining and other “big data” applications, and many others.

The scope of Computational Linguistics with Artificial Intelligence (AI) is vast and promising. Computational Linguistics is the study of using computers to process and understand natural language, while AI focuses on developing machines and algorithms that can simulate human-like intelligence. When combined, these fields have the potential to revolutionize various aspects of communication, information processing, and human-computer interaction. Here are some key areas where the intersection of Computational Linguistics and AI has significant scope.

**Natural Language Processing (NLP):** NLP is at the forefront of AI applications in language-related tasks. It involves the development of algorithms and models that enable machines to understand, interpret, and generate human language. NLP applications include machine translation, sentiment analysis, speech recognition, chatbots, virtual assistants, and text summarization.

**Machine Translation**: With the globalization of businesses and communication, machine translation has become crucial. AI-powered systems use computational linguistics techniques to improve the accuracy and fluency of translations between various languages. Sentiment Analysis: Computational Linguistics and AI can be employed to analyze and determine the sentiment or emotions expressed in text data, which is invaluable for understanding customer feedback, public opinion, and social media trends.

**Speech Recognition:** AI-driven speech recognition systems use computational linguistics techniques to convert spoken language into written text. This technology is used in virtual assistants, voice-controlled devices, transcription services, and more.

**Information Retrieval:** AI and computational linguistics play a role in improving information retrieval systems, making it easier for users to find relevant information from vast databases and the internet.

**Question Answering Systems:** AI-powered question-answering systems use computational linguistics techniques to process natural language questions and provide relevant answers, as seen in virtual assistants or chatbots.

**Language Learning and Teaching**: AI and computational linguistics can facilitate language learning through interactive applications, intelligent tutoring systems, and personalized language courses. Text Mining and Data Analysis: AI-driven computational linguistics tools can extract valuable insights from large volumes of unstructured text data, aiding in various fields like market research, business intelligence, and social sciences

**Conversational AI**: AI-powered chatbots and conversational agents are becoming more sophisticated, thanks to computational linguistics advancements, leading to improved human-computer interactions. Sentiment-aware applications: AI models can be enhanced with computational linguistics to create sentiment-aware applications, such as emotion-sensitive user interfaces, personalized marketing strategies, and sentiment-aware content recommendation systems.

**Healthcare and Biomedical Text Analysis:** AI-powered computational linguistics tools can aid in extracting relevant information from medical literature, patient records, and other biomedical texts, supporting research and clinical decision-making.

Overall, the scope of Computational Linguistics with Artificial Intelligence is continuously expanding, and it is expected to impact numerous industries and aspects of our daily lives, making communication with machines more natural and efficient.

There are also linguistics jobs in the software industry that do not necessarily require much programming background— for example, speech data evaluators, linguistic data managers, [annotators](https://www.toplanguagejobs.com/Top-Language-Jobs/Bilingual-Jobs/Linguist-Annotator/Details/10559799?utm_campaign=google_jobs_apply&utm_source=google_jobs_apply&utm_medium=organic), and [localization specialists](http://en.wikipedia.org/wiki/Language_localisation).

**How to get into computational linguistics, here are the areas you should concentrate on:**

* **Programming.** The Schools of Computer Sciences & Engineering offers a series of courses beginning with :
  1. Critical Thinking in the Digital Information Age.
  2. Introduction to Programming and Problem Solving.
  3. For self-study, try encoding books specially aimed at linguists, such as Michael Hammonds’ books on Perl and Java, or Bird et al.’s book on Python. There are also many free online courses such as EdX’s Python course etc.
* **Math and statistics.** Computational linguistics often uses statistical methods. Introduction to Research Methods provides a basic introduction to statistics; there is also more advanced coursework available in other departments. In addition, programming requires some maths background.
* **Linguistics.** The most relevant courses for computational linguists are those that deal with structural aspects of language (syntax, semantics, phonology, and phonetics), usage patterns and variation (sociolinguistics, discourse), psycholinguistics, and research methods (including corpus linguistics).
* **Natural language processing.** Online courses are available – including those from National Research University, UT Austin, and Stanford etc.

The above fields are highly demanding at present, the scopes of above fields are very much focused.

**Preservation & Protection of Law’s**

Till now, there is no specific section or law in India that grants protection to artificial intelligence (AI) as a whole. Intellectual property laws and regulations in India, such as patents, copyright, and trade secrets, can be used to protect certain aspects of AI, like AI-based inventions, software, and algorithms, but not AI as a concept or technology itself.

Here's a brief overview of how different intellectual property aspects can apply to AI in India

**Patents**: In India, you can apply for a patent for a new and inventive AI-based technology or algorithm, provided it meets the patentability criteria of novelty, inventive footstep, and commercial applicability. The patent must be directed to a concrete application or implementation of AI rather than the AI concept itself.

**Copyright**: Copyright protection in India covers original works of authorship fixed in a tangible medium. While computer programs, including AI software, are eligible for copyright protection, the protection extends to the specific expression of the software rather than the ideas or concepts behind it.

**Trade Secrets**: AI-related trade secrets, such as proprietary algorithms or datasets, can be protected through appropriate measures like confidentiality agreements and non-disclosure agreements (NDAs).

It's essential to note that the legal landscape may evolve over time, and new regulations or laws specific to AI might be introduced in the future. Additionally, international treaties and agreements, such as the World Intellectual Property Organization (**WIPO)** treaties, also play a role in shaping intellectual property protection for AI in India.

If you have specific concerns about protecting AI-related innovations or intellectual property in India, it is advisable to consult with a qualified intellectual property attorney or legal expert who can provide tailored advice based on the latest laws and developments.

**Role of Computational Linguistics & AI in Language documentation:**

The process of documentation is creating a record of past and present for future reference. “Language documentation is a lasting, multipurpose record of a language”. (Gippert and P. Himmelmann. Pg.1, 2006). The verbal and nonverbal communication has to be recorded through field observation, direct interview, or questionnaire method. By these techniques, the corpus data is collected and data of the languages are archived for future reference and documentation, and digitalization. The data is mostly stored in digitalized form, which is in the form of voice composition of verbal communication as well as a written record. It has a complicated process in which the surveyor designs the questionnaire as per the requirement of the language, which suits the informant to give available information about their language.

**Further education:**

Various kinds of courses are being offered by several universities in India and abroad for Indian nationals on the methodologies of documentation and digitalization. These universities are imparting education in the subject of Linguistics, which helps to learn how to properly document the language. The course is being offered as-

* B. Tech (Artificial Intelligence)
* B.Tech (CCML)
* BCA (AI, DS)
* MA in Linguistics
* MA in Language Documentation
* MA in Field Linguistics
* MA in computational linguistics.
* [Certificate in computational linguistics](http://www-rohan.sdsu.edu/~gawron/CompLingCert.rtf).
* [B.A. in Computational Linguistics](http://www.fresnostate.edu/catalog/subjects/linguistics/ling-comp.html)
* PhD
* Post Doc.

**The Universities, where can you Study?**

The person who does his/her B.Tech, MA or diploma in the abovementioned courses can apply for project manager as a **junior resource person** and **senior resource person,** and many other designation. The universities and institutions which are offering these courses in India and abroad are as follows among others:

**Indian Universities and Institutions:**

* IITs
* IISEs
* NITs
* University of Lucknow
* Babu Banarasi Das University, Lucknow
* Delhi University
* Jawaharlal Nehru University, Delhi
* Jadavpur University Kolkata
* Ambedkar University Agra
* Banaras Hindu University Varanasi

**Foreign Universities:**

There are several renowned universities around the world that offer excellent programs in Computational Linguistics and related fields. Here are some foreign universities known for their strong Computational Linguistics study programs:

* University of Edinburgh - United Kingdom: The University of Edinburgh is well-known for its School of Informatics, which offers an exceptional program in Natural Language Processing and Computational Linguistics.
* University of Cambridge - United Kingdom: The Computer Laboratory at the University of Cambridge offers research and study opportunities in Natural Language Processing and Machine Learning.
* University of Stuttgart - Germany: The University of Stuttgart has a prominent Institute for Natural Language Processing (IMS) that offers cutting-edge research and study programs in Computational Linguistics.
* Saarland University - Germany: Located in Saarbrücken, Germany, this university is home to the Department of Computational Linguistics and Phonetics, which is renowned for its research in various language processing areas.
* University of Groningen - Netherlands: The University of Groningen offers a Master's program in Human Language Technology (HLT), which covers a range of topics in Computational Linguistics.
* University of Zurich - Switzerland: The University of Zurich has a Department of Computational Linguistics that offers courses and research opportunities in NLP and related fields.
* University of Melbourne - Australia: The University of Melbourne offers programs in Language Technology and Computational Linguistics within the School of Computing and Information Systems.
* University of Washington - USA: The Department of Linguistics at the University of Washington offers research and study opportunities in Computational Linguistics and Natural Language Processing.
* Carnegie Mellon University - USA: Carnegie Mellon has a Language Technologies Institute that offers various programs and research opportunities in Computational Linguistics and NLP.
* Stanford University - USA: Stanford offers courses and research opportunities in Natural Language Processing and Computational Linguistics through its Department of Linguistics and Computer Science Department.
* University of California, Berkeley - USA: UC Berkeley offers courses and research opportunities in Computational Linguistics and NLP within its Department of Electrical Engineering and Computer Sciences.
* University of Toronto - Canada: The University of Toronto offers a Computational Linguistics program through its Department of Computer Science.

These universities provide excellent opportunities for pursuing advanced studies and research in Computational Linguistics and related disciplines. However, it's essential to explore their specific programs, faculty expertise, and available resources to find the best fit for your academic and research interests. Additionally, program availability and details might change over time, so always check the university's official website for the most up-to-date information before applying.

**Finding jobs and internships**

Sites with job and internship postings:

* [Linguist List](https://new.linguistlist.org/)
* [Association for Computational Linguistics](http://aclweb.org/aclwiki/index.php?title=Employment_opportunities,_postdoctoral_positions,_summer_jobs)
* [Dice.com](http://www.dice.com/)
* [KD Nuggets](http://www.kdnuggets.com/jobs/)
* [NLP People](https://nlppeople.com/)

The following are a few companies that employ computational linguists:

* The usual tech giants: [Google](https://www.google.com/about/careers/search#t=sq&q=j&d=linguist&li=10&j=linguist) (including the [NLP research group](http://research.google.com/pubs/NaturalLanguageProcessing.html)), [Microsoft](http://careers.microsoft.com/gclp.aspx) (including the [NLP research group](http://research.microsoft.com/en-us/groups/nlp/) in Redmond), [Verizon Media](http://us.careers.yahoo.com/), [Apple](http://www.apple.com/jobs/us/index.html), etc.
* [Alelo](https://www.alelo.com/apply-with-us/)
* [Appen Butler Hill](https://appen.com/careers/)
* [Chenope](http://chenope.com/)
* [Decooda](http://decooda.com/careers/)
* [Expert System](https://expertsystem.com/careers/)
* [Facebook](https://www.facebook.com/careers/university)
* [Intel](http://jobs.intel.com/)
* [Lingsoft](https://www.lingsoft.fi/en/lingsoft/jobs)
* [Lionbridge](https://www.lionbridge.com/join-our-team/)
* [Mitre Corporation](http://www.mitre.org/employment/index.html)
* [MultiLingual](https://multilingual.com/career-opportunities/)
* [North Side](http://northsideinc.com/)
* [Nuance](https://jobs.nuance.com/)
* [Oracle](http://www.oracle.com/us/corporate/careers/index.html)
* [SDL](https://www.sdl.com/about/career/)
* [SRI International](https://www.sri.com/careers/)
* [Systran](http://www.systransoft.com/systran/jobs)
* [Vantage Linguistics](http://www.vantagelinguistics.com/corporate/careers.html)
* [Verilogue](https://www.verilogue.com/company/careers/)
* [Voiceweb](http://www.voiceweb.eu/careers)
* [VoxGen](http://www.voxgen.com/)
* Amazon

**Conclusion:**

The ever expanding business and global correspondence, AI has significant role to play to make the job of communication across linguistic and cultural variations easier. However, though AI is being perceived as a threat too many professional, it at the same time, offers an opportunity to many individuals with renewed skills. For example the individual who possess the required skills in programming and computational linguistics may seek a career in this filed.