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# Introduction to Natural Language Processing (NLP) 2016



## Natural Language Processing Summary

The field of study that focuses on the interactions between human language and computers is called Natural Language Processing, or NLP for short. It sits at the intersection of computer science, artificial intelligence, and computational linguistics ([Wikipedia](#)).

"Natural Language Processing is a field that covers computer understanding and manipulation of human language, and it's ripe with possibilities for newsgathering," Anthony Pesce said in [Natural Language Processing in the kitchen](#). "You usually hear about it in the context of analyzing large pools of legislation or other document sets, attempting to discover patterns or root out corruption."

## What is natural language processing?

## What is Natural Language Processing?

NLP is a way for computers to analyze, understand, and derive meaning from human language in a smart and useful way. By utilizing NLP, developers can organize and structure knowledge to perform tasks such as automatic summarization, translation, named entity recognition, relationship extraction, sentiment analysis, speech recognition, and topic segmentation.

“Apart from common word processor operations that treat text like a mere sequence of symbols, NLP considers the hierarchical structure of language: several words make a phrase, several phrases make a sentence and, ultimately, sentences convey ideas,” John Rehling, an NLP expert at Meltwater Group, said in *How Natural Language Processing Helps Uncover Social Media Sentiment*. “By analyzing language for its meaning, NLP systems have long filled useful roles, such as correcting grammar, converting speech to text and automatically translating between languages.”

NLP is used to analyze text, allowing machines to understand how human's speak. This human-computer interaction enables real-world applications like automatic text summarization, sentiment analysis, topic extraction, named entity recognition, parts-of-speech tagging, relationship extraction, stemming, and more. NLP is commonly used for text mining, machine translation, and automated question answering.

NLP is characterized as a hard problem in computer science. Human language is rarely precise, or plainly spoken. To understand human language is to understand not only the words, but the concepts and how they're linked together to create meaning. Despite language being one of the easiest things for humans to learn, the ambiguity of language is what makes natural language processing a difficult problem for computers to master.

# What Can Developers Use NLP Algorithms For?

NLP algorithms are typically based on machine learning algorithms. Instead of hand-coding large sets of rules, NLP can rely on machine learning to automatically learn these rules by analyzing a set of examples (i.e. a large corpus, like a book, down to a collection of sentences), and making a statical inference. In general, the more data analyzed, the more accurate the model will be.

- **Summarize blocks of text** using [Summarizer](#) to extract the most important and central ideas while ignoring irrelevant information.
- Create a **chat bot** using [Parsey McParseface](#), a language parsing deep learning model made by Google that uses [Point-of-Speech tagging](#).
- **Automatically generate keyword tags** from content using [AutoTag](#), which leverages LDA, a technique that discovers topics contained within a body of text.
- **Identify the type of entity extracted**, such as it being a person, place, or organization using [Named Entity Recognition](#).
- Use [Sentiment Analysis](#) to **identify the sentiment of a string of text**, from very negative to neutral to very positive.
- **Reduce words to their root**, or stem, using [PorterStemmer](#), or **break up text into tokens** using [Tokenizer](#).

## Open Source NLP Libraries

[Algorithmia](#) provides the [Algorithmia Learning Service](#) which is a cloud-based application programming interface (API) that provides a [free API endpoint](#) for many of these algorithms, without ever having to setup or provision servers and infrastructure.

- [Apache OpenNLP](#): a machine learning toolkit that provides [tokenizers](#), sentence segmentation, [part-of-speech tagging](#), [named entity extraction](#), [chunking](#), [parsing](#), coreference resolution, and more.
- [Natural Language Toolkit \(NLTK\)](#): a Python library that provides modules for processing text, classifying, tokenizing, stemming, tagging, parsing, and more.
- [Stanford NLP](#): a suite of NLP tools that provide [part-of-speech tagging](#), the [named entity recognizer](#), [coreference resolutionsystem](#), [sentiment analysis](#), and more.
- [MALLET](#): a Java package that provides [Latent Dirichlet Allocation](#), document classification, clustering, topic modeling, information extraction, and more.

## A Few NLP Examples

- Use [Summarizer](#) to automatically summarize a block of text, exacting topic sentences, and ignoring the rest.
- Generate keyword topic tags from a document using [LDA \(Latent Dirichlet Allocation\)](#), which determines the most relevant words from a document. This algorithm is at the heart of the [Auto-Tag](#) and [Auto-Tag URL](#) microservices.

- **Sentiment Analysis**, based on StanfordNLP, can be used to identify the feeling, opinion, or belief of a statement, from very negative, to neutral, to very positive. Often, developers will use an algorithm to identify the sentiment of a term in a sentence, or use sentiment analysis to analyze social media.

NLP algorithms can be extremely helpful for web developers, providing them with the turnkey tools needed to create advanced applications, and prototypes.

## Example Natural Language Processing Use Cases

NLP algorithms are typically based on machine learning algorithms. Instead of hand-coding large sets of rules, NLP can rely on machine learning to automatically learn these rules by analyzing a set of examples (i.e. a large corpus, like a book, down to a collection of sentences), and making a statistical inference. In general, the more data analyzed, the more accurate the model will be.

Social media analysis is a great example of NLP use. Brands track conversations online to understand what customers are saying, and glean insight into user behavior.

“One of the most compelling ways NLP offers valuable intelligence is by tracking sentiment — the tone of a written message (tweet, Facebook update, etc.) — and tag that text as positive, negative or neutral,” Rehling said.

### Build your own social media monitoring tool

1. Start by using the algorithm [Retrieve Tweets With Keyword](#) to capture all mentions of your brand name on Twitter. In our case, we search for mentions of Algorithmia.
2. Then, pipe the results into the [Sentiment Analysis algorithm](#), which will assign a sentiment rating from 0-4 for each string (Tweet).

Similarly, Facebook uses NLP to track trending topics and popular hashtags.

“Hashtags and topics are two different ways of grouping and participating in conversations,” Chris Struhar, a software engineer on News Feed, said in [How Facebook Built Trending Topics With Natural Language Processing](#). “So don’t think Facebook won’t recognize a string as a topic without a hashtag in front of it. Rather, it’s all about NLP: natural language processing. Ain’t nothing natural about a hashtag, so Facebook instead parses strings and figures out which strings are referring to nodes — objects in the network. We look at the text, and we try to understand what that was about.”

It’s not just social media that can use NLP to its benefit. Publishers are hoping to use NLP to improve the quality of their online communities by leveraging technology to “auto-filter the offensive comments on news sites to save moderators from what can be an ‘exhausting process’,” Francis Tseng said in [Prototype winner using ‘natural language processing’ to solve journalism’s commenting problem](#).

Other practical uses of NLP include [monitoring for malicious digital attacks](#), such as phishing, or [detecting when somebody is lying](#).

## Use NLP to build your own RSS reader

You can [build a machine learning RSS reader in less than 30-minutes](#) using the follow algorithms:

1. [ScrapeRSS](#) to grab the title and content from an RSS feed.
2. [Html2Text](#) to keep the important text, but strip all the HTML from the document.
3. [AutoTag](#) uses [Latent Dirichlet Allocation](#) to identify relevant keywords from the text.
4. [Sentiment Analysis](#) is then used to identify if the article is positive, negative, or neutral.
5. [Summarizer](#) is finally used to identify the key sentences.

## Recommended NLP Books for Beginners

- [Speech and Language Processing](#): "The first of its kind to thoroughly cover language technology – at all levels and with all modern technologies – this book takes an empirical approach to the subject, based on applying statistical and other machine-learning algorithms to large corporations."
- [Foundations of Statistical Natural Language Processing](#): "This foundational text is the first comprehensive introduction to statistical natural language processing (NLP) to appear. The book contains all the theory and algorithms needed for building NLP tools. It provides broad but rigorous coverage of mathematical and linguistic foundations, as well as detailed discussion of statistical methods, allowing students and researchers to construct their own implementations. The book covers collocation finding, word sense disambiguation, probabilistic parsing, information retrieval, and other applications."
- [Handbook of Natural Language Processing](#): "The Second Edition presents practical tools and techniques for implementing natural language processing in computer systems. Along with removing outdated material, this edition updates every chapter and expands the content to include emerging areas, such as sentiment analysis."
- [Statistical Language Learning \(Language, Speech, and Communication\)](#): "Eugene Charniak breaks new ground in artificial intelligenceresearch by presenting statistical language processing from an artificial intelligence point of view in a text for researchers and scientists with a traditional computer science background."
- [Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit](#)  
*"This is a book about Natural Language Processing. By "natural language" we mean a language that is used for everyday communication by humans; languages like English, Hindi or Portuguese. At one extreme, it could be as simple as counting word frequencies to compare different writing styles.*
- [Speech and Language Processing, 2nd Edition](#)  
*"An explosion of Web-based language techniques, merging of distinct fields, availability of phone-based dialogue systems, and much more make this an exciting time in speech and language processing. The first of its kind to thoroughly cover language technology – at all levels and with all modern technologies – this text takes an empirical approach to the subject, based on applying statistical and other machine-learning algorithms to large corporations. The authors cover areas that traditionally are taught in different courses, to describe a unified vision of speech and language processing."*



- [Introduction to Information Retrieval](#)

*"As recently as the 1990s, studies showed that most people preferred getting information from other people rather than from information retrieval systems. However, during the last decade, relentless optimization of information retrieval effectiveness has driven web search engines to new quality levels where most people are satisfied most of the time, and web search has become a standard and often preferred source of information finding. For example, the 2004 Pew Internet Survey (Fallows, 2004) found that 92% of Internet users say the Internet is a good place to go for getting everyday information." To the surprise of many, the field of information retrieval has moved from being a primarily academic discipline to being the basis underlying most people's preferred means of information access."*

## NLP Tutorials

- [Natural Language Processing Tutorial](#): "We will go from tokenization to feature extraction to creating a model using a machine learning algorithm. You can get the source of the post from github."
- [Basic Natural Language Processing](#): "In this tutorial competition, we dig a little "deeper" into sentiment analysis. People express their emotions in language that is often obscured by sarcasm, ambiguity, and plays on words, all of which could be very misleading for both humans and computers."
- [An NLP tutorial with Roger Ebert](#): "Natural Language Processing is the process of extracting information from text and speech. In this post, we walk through different approaches for automatically extracting information from text—keyword-based, statistical, machine learning—to explain why many organizations are now moving towards the more sophisticated machine-learning approaches to managing text data."

If you're interested in learning more, this free introductory course from Stanford University will help you [will learn the fundamentals of natural language processing](#), and how you can use it to solve practical problems.

1 - 1 - Course Introduction - Stanford NLP - Professor Dan Jurafs...

Once you've gotten the fundamentals down, apply what you've learned using [Python and NLTK](#), the most popular framework for Python NLP.

## Natural Language Processing With Python and NLTK p.1 Tokenizi...

## NLP Videos

- [Natural Language Processing With Python and NLTK p.1 Tokenizing words and Sentences](#)
- [NLP Fundamentals: What is Natural Language Processing?](#)

## NLP Courses

- [Stanford Natural Language Processing on Coursera](#)  
*"This course covers a broad range of topics in natural language processing, including word and sentence tokenization, text classification and sentiment analysis, spelling correction, information extraction, parsing, meaning extraction, and question answering. We will also introduce the underlying theory from probability, statistics, and machine learning that are crucial for the field, and cover fundamental algorithms like n-gram language modeling, naive bayes and maxent classifiers, sequence models like Hidden Markov Models, probabilistic dependency and constituent parsing, and vector-space models of meaning."*
- [Stanford Machine Learning on Coursera](#)  
*"Machine learning is the science of getting computers to act without being explicitly programmed. Many researchers also think it is the best way to make progress towards human-level AI. In this class, you will learn about the most effective machine learning techniques, and gain practice implementing them and getting them to work for yourself."*
- [Udemy's Introduction to Natural Language Processing](#)  
*"This course introduces Natural Language Processing through the use of python and the Natural Language Tool Kit. Through a practical approach, you'll get hands on experience working with and analyzing text. As a student of this course, you'll get updates for free, which include lecture revisions, new code examples, and new data projects."*

- [Certificate in Natural Language Technology](#)  
*"When you talk to your mobile device or car navigation system – or it talks to you – you're experiencing the fruits of developments in natural language processing. This field, which focuses on the creation of software that can analyze and understand human languages, has grown rapidly in recent years and now has many technological applications. In this three-course certificate program, we'll explore the foundations of computational linguistics, the academic discipline that underlies NLP."*
  - [Natural language processing \(Wikipedia\)](#): "Natural language processing (NLP) is a field of computer science, artificial intelligence, and computational linguistics concerned with the interactions between computers and human (natural) languages. In 1950, Alan Turing published an article titled 'Computing Machinery and Intelligence' which proposed what is now called the Turing test as a criterion of intelligence. Starting in the late 1980s, however, there was a revolution in NLP with the introduction of machine learning algorithms for language processing."
  - [Outline of natural language processing \(Wikipedia\)](#): "The following outline is provided as an overview of and topical guide to natural language processing: Natural language processing – computer activity in which computers are entailed to analyze, understand, alter, or generate natural language."
  - [Apache OpenNLP](#): "The Apache OpenNLP library is a machine learning based toolkit for the processing of natural language text."
  - [Natural Language Toolkit](#): "NLTK is a leading platform for building Python programs to work with human language data. It provides easy-to-use interfaces to over 50 corpora and lexical resources such as WordNet, along with a suite of text processing libraries for classification, tokenization, stemming, tagging, parsing, and semantic reasoning, wrappers for industrial-strength NLP libraries, and an active discussion forum. Natural Language Processing with Python provides a practical introduction to programming for language processing."
  - [Six Natural Language Processing Algorithms for Web Developers](#)
  - [A curated list of speech and natural language processing resources](#)
  - [NLP research group at google](#)
  - [General Introduction to NLP](#)
  - [Natural language processing: an introduction](#)
  - [Stanford CS 224D Video: Deep Learning for Natural Language Processing](#)
  - [CS 388: Natural Language Processing](#)
  - [COMS W4705: Natural Language Processing](#)
  - [CS 674: Natural Language Processing](#)
  - [CS918 Natural Language Processing](#)
  - [r/LanguageTechnology](#)
  - [Everything You Need to Know about Natural Language Processing](#)
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## Matt Kiser

Product manager at Algorithmia helping to give developers super powers.

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