

Unit-1

Introduction to Natural Language

The study of Language, Applications of NLP,
Evaluating Language Understanding systems,
Different Levels of Language Analysis,
Representations and Understanding, Organization
of NL understanding systems, Linguistic
Background: An outline of English syntax

Introduction to NL:-

NL is the way we communicate with each other using spoken or written words that follow the rules of grammar and syntax.

NLP is a branch of AI that focuses on the interaction b/w computers and humans through natural language.

It involves tasks, like language understanding, sentiment analysis, and language generation.

From chatbots to language translation apps, NLP plays a crucial role in making technology more user-friendly and accessible.

Computers can understand the structured form of data like spreadsheets and the tables in the database, but human languages, texts, and voices form an unstructured category of data, and it gets difficult for the computer to understand it, and there arises the need for NLP.

Humans have been writing for thousands of years, there are a lot of literature pieces available, and it would be great if we make computers understand that.

There are various challenges floating out in NLP like understanding the correct meaning of sentences, correct NER, correct prediction of various parts of speech, coreference resolution.

In NLP, we can break down the process of understanding English for a model into a number of small pieces.

The primary goal of NLP is to enable computers to understand, interpret and generate NL, the way humans do.

NLP involves a variety of techniques, including computational linguistics, ML and statistical modeling.

These techniques are used to analyze, understand, and manipulate human language data, including text, speech and other forms of communication.

NLP involves the use of several techniques, such as ML, DL and rule based systems.

Some popular tools and libraries used in NLP include NLTK, spaCy and Gensim.

Advantages:

- (i) Improves human-computer interaction.
- (ii) Automates repetitive tasks:
text summarization, sentiment analysis & language translation.

- (ii) Enables new applications :
virtual assistants, chatbots, and question answering systems.
- (iv) Improves decision-making.
Social media posts, customer feedback.
- (v) Improves accessibility.
Text to speech and S2T.
- (vi) Facilitates multilingual communication.
- (vii) Improves Information retrieval.
- (ix) Improves Content Creation.
- (x) Supports data analytics.

Disadvantages:

- Limited understanding of context.
- Requires large amounts of data.
- Limited ability to understand idioms and sarcasm.
- Limited ability to understand emotions.
- Difficulty with multi-lingual processing.
- Dependency on language resources.
- Difficulty with slang or ambiguous words.
- Lack of creativity.

The Study of Language:-

Language is one of the fundamental aspects of human behavior and is a crucial component of our lives.

In written form it serves as a long-term record of knowledge from one generation to the next.

In spoken form it serves as our primary means of coordinating our day-to-day behavior with others.

The ultimate goal is to be able to specify models that approach human performance in the linguistic tasks of reading, writing, hearing and speaking.

Computational models are useful for both scientific purposes and for exploring the nature of linguistic communication and for practical purposes for enabling effective human-machine communication.

Language is studied in several different academic disciplines.

- The linguist, for instance studies the structure of language itself, considering Q's such as why certain combinations of words form sentences and why a sentence can have some meanings.
- The psycholinguist on the other hand, studies the process of human language production and comprehension, considering Q's such as how people identify the appropriate structure of a sentence.
- The philosopher considers how words can mean anything at all and how they identify objects in the world.

The philosophers also consider what it means to have beliefs, goals and intentions and how these cognitive capabilities relate to language.

The goal of the computational linguist is to develop a computational theory of language, using the notions of algorithms and data structures from computer science.

There are 2 motivations for developing computational models.

→ The scientific motivation is to obtain a better understanding of how language works.

Computational models may provide very specific predictions about human behavior that can then be explored by the psycholinguist.

→ The practical or technological motivation is that NLP capabilities would revolutionize the way computers are used.

Since most of human knowledge is recorded in linguistic form, computers that could understand NL could access all the information.

In addition, NL interfaces to computers would allow complex systems to be accessible to everyone.

Such systems would be considerably more flexible, and intelligent than is possible with current computer technology.

The study of language, known as linguistics, is a fascinating exploration into the structure, evolution, and use of languages.

Linguists delve into the intricacies of sounds, grammar, semantics, and cultural influences that shape the way we communicate.

Phonetics examines the physical sounds of speech, while phonology studies the abstract, cognitive aspects of sound patterns.

Morphology delves into the structure of words, and syntax explores the arrangement of words in sentences.

Semantics explores the meaning of words and how they combine to form meaningful expressions. While pragmatics investigates how context influences language use.

Sociolinguistics looks at how language varies across different social groups, and historical linguistics traces the evolution of languages over time.

The study of language is not just about words and grammar. It is a multidimensional exploration of the very essence of human communication and expression.

Applications of NLU & NLP:-

The applications can be divided into 2 major classes:- text-based applications and dialogue-based applications.

Text-based applications involve the processing of written text, such as books, newspapers, reports, manuals, e-mail messages, and so on.

Text-based NL research is ongoing in applications such as

- Finding appropriate documents on certain topics from a DB of texts.
- Extracting information from messages & articles on certain topics.
- Translating documents from one language to another.

Some machine translation systems have been built on pattern matching.

i.e., sequence of words in one language is associated with a sequence of words in another language.

- Dialogue-based applications involve human-machine communication. Typical potential applications include,
- question answering systems, where NL is used to query a DB.
 - Automated customer service over the telephone.
 - Tutoring systems, where the machine interacts with a student.
 - spoken language control of a machine.
 - General cooperative problem solving systems.

It is important to distinguish the problems of speech recognition from the problems of language understanding.

A speech recognition system need not involve any language understanding. The words recognized are used as commands, much like the commands you send to a VCR using a remote control.

Speech recognition is concerned only with identifying the words spoken from a given speech signal, not with understanding how words are used to communicate.

To be an understanding system, the speech recognizer would need to feed its input to a NLU system, producing what is often called a spoken language understanding system.

NLP has a wide range of applications that span various industries.

Chatbots and Virtual Assistants:

NLP powers chatbots like those you find on websites or virtual assistants like Siri and Alexa.

They understand and respond to human language.

Sentiment Analysis:

Businesses use NLP to analyze social media, customer reviews, and feedback to understand the sentiment behind the text.

Language Translation:

NLP enables real-time language translation in applications like Google Translate.

It helps break down language barriers and facilitates communication b/w people who speak different languages.

Text Summarization:

NLP algorithms can summarize large volumes of text, making it easier for users to grasp the main points without going through the entire document.

Spell and Grammar Checking:

The autocorrect feature on your phone, thanks to NLP, does that. It helps in improving the accuracy of written text.

Search Engines:

When you type a query into a search engine, NLP algorithms work to understand your intent and provide relevant search results.

Healthcare Applications:

NLP is used to extract valuable information from medical records, research papers, and clinical notes.

It aids in diagnosis, treatment planning, and research.

Fraud Detection:

In finance, NLP can be used to analyze patterns in communication data to detect potential instances of fraud or unusual activities.

Legal Document Analysis:

NLP helps in processing and analyzing vast amounts of legal documents, making legal research more efficient and accurate.

Content Creation:

Some AI tools powered by NLP can assist in generating human-like text, from writing articles to creating marketing content.

Evaluating Language Understanding Systems:-

To evaluate a system is to run the program and see how well it performs the task it was designed to do.

If the system is designed to participate in simple conversations on a certain topic, you might try conversing with it.

This is called black box evaluation because it evaluates system performance without looking inside to see how it works.

This method of evaluation may be the best test of a system's capabilities. The techniques that produce the best results in the short term will not lead to the best results in the long term.

An alternative method of evaluation is to identify various subcomponents of a system and then evaluate each one with appropriate tests. This is called glass box evaluation because you look

inside at the structure of the system.
The problem with glass box evaluation is that it requires some consensus on what the various components of a NL system should be.

The ELIZA program that was developed in the mid-1960s at MIT. This program must be one of the most popular AI.

User	ELIZA
Men are all unlike.	In what way?
He says I'm depressed much of the time.	I am sorry to hear you are depressed.
I could learn to get along with my mother.	Tell me more about your family.
My mother takes care of me.	Who else in your family takes care of you?
My father	Your father.

ELIZA was never claimed to embody a theory of language comprehension and production.

The system plays the role of a therapist and, to obtain the best results, the user should correspondingly play the role of a patient.

In ELIZA there is a DB of particular words that are called keywords.

For each keyword, the system stores an integer, a pattern to match against the input, and a specification of the output.

eg: ?X are you ?Y

?X = why

?Y = looking at me

When the DB lists multiple output specifications for a given pattern, ELIZA selects a different one each time a keyword rule is used, thereby preventing unnatural repetition in the conversation.

Other crucial characteristics of the conversational setting also aid in sustaining the illusion of intelligence.

eg. The system does not need any world knowledge because it never has to make a claim, support an argument, or answer a question.

Evaluating LUS - Language Understanding systems is a critical task to ensure their effectiveness and accuracy.

Accuracy and Precision:

Assess the system's ability to understand and interpret language accurately. This includes measuring how often it provides correct responses and avoids false positives or negatives.

Coverage: A good LUS should be able to handle a diverse range of topics, contexts, and linguistic variations.

Context Awareness:

Test the system's capability to understand and maintain context over multiple turns of conversation.

Scalability:

Evaluate how well the system performs as the volume of data or complexity of tasks increases.

Robustness to Noise: Test the system's resilience to noisy or ambiguous input.

Multilingual Capabilities:

Assess the system's ability to understand and process multiple languages.

User Satisfaction: Gather feedback from users to evaluate their satisfaction with the system.

Adaptability and Learning:

Check if the system can adapt and improve over time based on user interactions.

Learning capabilities allow the system to enhance its understanding and performance through continuous exposure to new data.

Different Levels of Language Analysis:

A NL-system must use considerable knowledge about the structure of the language itself, including what the words are, how words combine to form sentences, what the words mean, how word meanings contribute to sentence meaning and so on..

The following are some of the different forms of knowledge relevant for NL understanding.

Phonetic and phonological knowledge:

Concerns how words are related to the sounds that realize them. Such knowledge is crucial for speech-based systems.

Morphological knowledge:

Concerns how words are constructed from more basic meaning units called morphemes.

A morpheme is the primitive unit of meaning in a language.

eg: friendly is derivable from the noun friend and the suffix 'ly', which transforms a noun into an adjective.

Syntactic knowledge:

Concerns how words can be put together to form correct sentences and determines what structural role each word plays in the sentence and what phrases are subparts of what other phrases.

Semantic knowledge:

Concerns what words mean and how these meanings - combine in sentences to form sentence meanings.

This is the study of context-independent meaning.

Pragmatic knowledge:

Concerns how sentences are used in different situations and how use affects the interpretation of the sentence.

Discourse knowledge:

Concerns how the immediately preceding sentences affect the interpretation of the next sentence.

World knowledge: - includes the general knowledge about the structure of the world that language users must have in order to maintain a conversation.

Language is one of the fundamental aspects of human behavior and is a crucial

Component of our lives.

The following example may help you understand the distinction b/w syntax, semantics, and pragmatics.

eg. Green frogs have large noses.

Green ideas have large noses.

Large have green ideas nose.

Language analysis can be conducted at various levels, each providing insights into different aspects of communication.

Phonetics: Physical sounds of speech, articulation, acoustic properties, auditory perception.

Phonology: Studies the abstract, cognitive aspects of sound patterns.

Morphology: Analyzes the structure of words.

Syntax: Investigates the arrangement of words in sentences and the rules governing their structure.

Semantics: Focuses on the meaning of the words, phrases, and sentences.

Pragmatics: The use of language in context, considering factors such as tone, intention, and social dynamics.

Pragmatics helps understanding how meaning can vary based on the situational content.

Sociolinguistics: Investigates the relationship b/w language and society.

Psycholinguistics: The psychological processes involved in language acquisition, comprehension, and production.

Computational Linguistics: Involves the dev and use of computational models to analyze and process language.

It includes NLP and ML techniques for tasks like LV, translation, and sentiment analysis.

Historical Linguistics: Historical linguistics explores language change, language families, and the relationships b/w different languages.

Each level of language analysis provides a unique perspective, contributing to a comprehensive understanding of how language functions in different contexts and dimensions.

Representations and Understanding:

A crucial component of understanding involves computing a representation of the meaning of sentences and texts.

eg: cook has a sense as a verb and a noun.
still : noun, verb, adjective, and adverb.

To represent meaning, we must have a more precise language. The tools to do this come from mathematics and logic and involve the use of formally specified representation languages.

Formal languages are specified from very simple building blocks.

The most fundamental is the notion of an atomic symbol which is distinguishable from any other atomic symbol simply based on how it is written.

Useful representation languages have the following 2 properties:

- The representation must be precise and unambiguous.
- The representation should capture the intuitive structure of the NL sentences that it represents.

Representing sentence structure: Syntax.

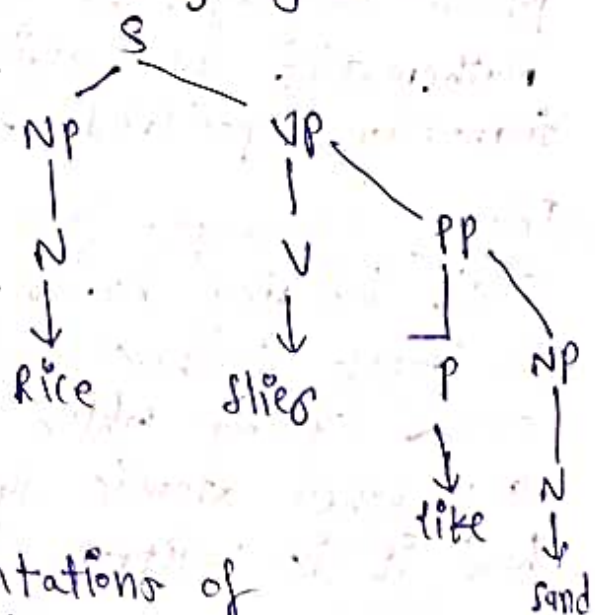
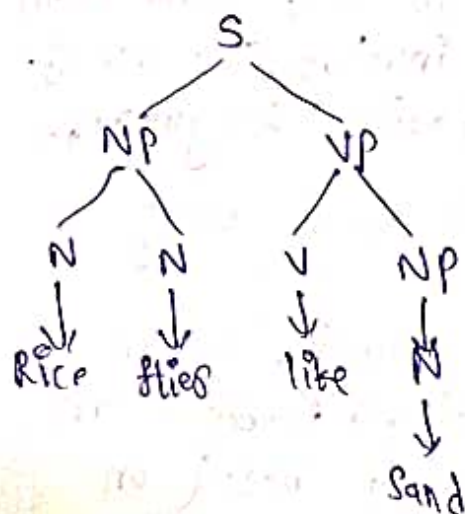
The syntactic structure of a sentence indicates the way that words in the sentence are related to each other.

This structure indicates how the words are grouped together into phrases, what words modify what other words, and what words are of central importance in the sentence.

This structure may identify the types of relationships that exist b/w phrases and can store other information about the particular sentence structure that may be needed for later processing.

eg: 1) John sold the book to Mary.

2) The book was sold to Mary by John.



Two structural representations of Rice flies like sand.

Making judgements on grammaticality is not a goal in NLU. A robust system should be able to understand ill-formed sentences whenever possible.

Agreement checks are essential for eliminating potential ambiguities.

Most syntactic representations of language are based on the notion of context-free grammars, which represent sentence structure in terms of what phrases are subparts of other phrases. This information is often presented in a tree form.

The Logical Form:

The structure of a sentence doesn't reflect its meaning.

eg: the NP "the catch" can have different meanings depending on whether the speaker is talking about a baseball game or a fishing expedition.

Both these interpretations have the same syntactic structure, and the different meanings arise from an ambiguity concerning the sense of the word "catch".

The division is b/w context-independent meaning and context-dependent meaning.

The representation of the context-independent meaning of a sentence is called its logical form.

The logical form encodes possible word senses and identifies the semantic relationship b/w the words and phrases.

Many of these relationships are often captured using an abstract set of semantic relationships b/w the verb and its NPs.

The Final Meaning Representation:

The final representation needed is a general knowledge representation (KR), which the system uses to represent and reason about its application domain.

This is the language in which all the specific knowledge based on the appⁿ is represented.

The goal of contextual interpretation is to take a representation of the structure of a sentence and its logical form, and to map this into some expression in the KR that allows the system to perform appropriate task in the domain.

We will assume that the first-order predicate calculus (FOPC) is the final representation language because it is relatively well known, well studied, and is precisely defined.

Representations and understanding are fundamental concepts in the realm of AI, especially in the context of NLP and cognitive systems.

Representations:

Symbolic Representation:

Symbolic representation involve using symbols and rules to represent knowledge.

→ Connectionist Representation:

Understanding:

→ Symbolic understanding.

→ Statistical Understanding.

→ Embodied Understanding.

The Organization of NLU Systems:

The 3 levels of representations are syntactic structure, logical form, and the final meaning representation.

There are interpretation processes that map from one representation to the other.

For instance, the process that maps a sentence to its syntactic structure and logical form is called the parser.

It uses knowledge about word and word meanings (the lexicon) and a set of rules defining the legal structures (the grammar) in order to assign a syntactic structure and a logical form to an input sentence.

An alternative organization could perform syntactic processing first and then perform semantic interpretation on the resulting structures.

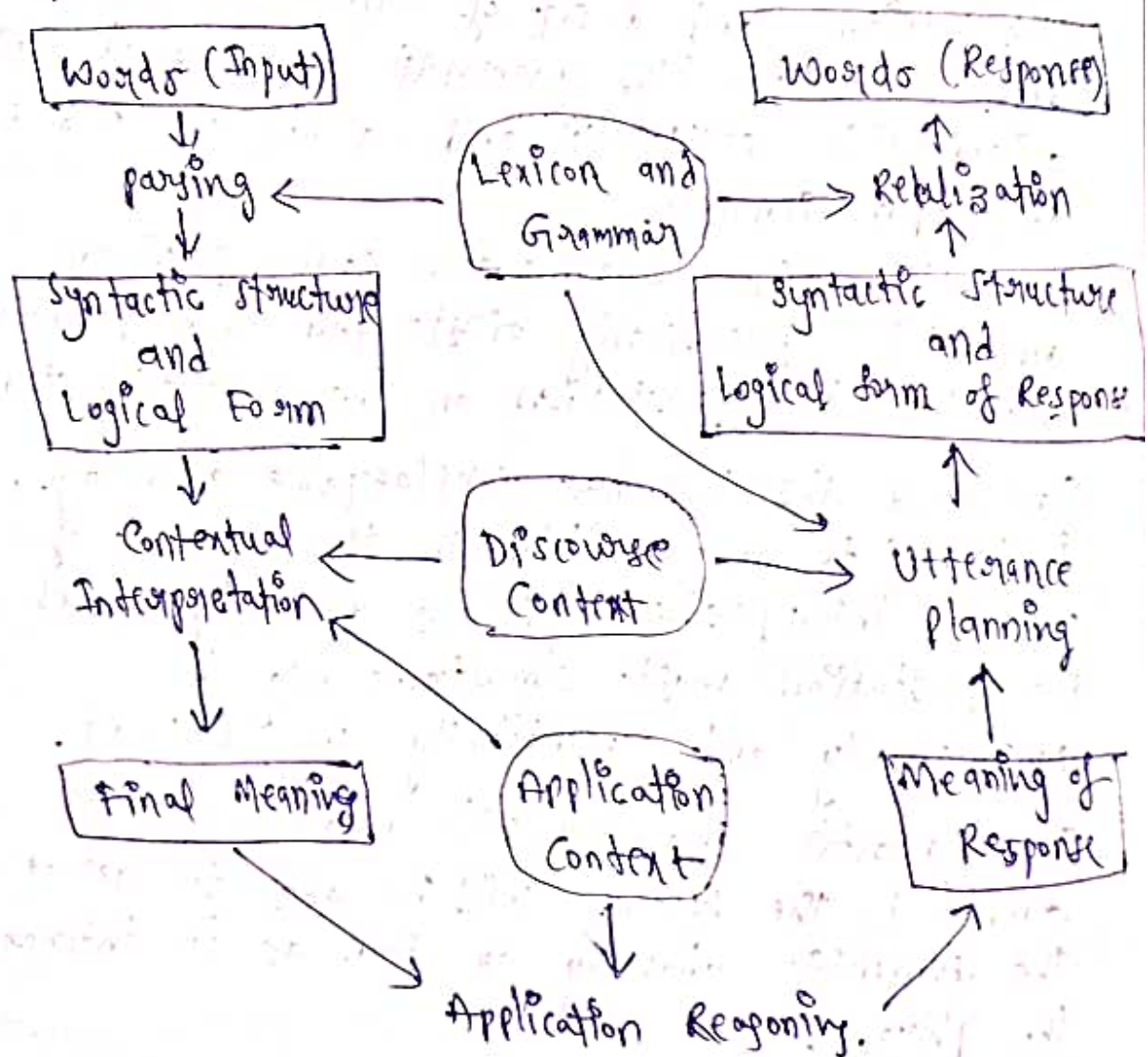
Combining the two has considerable advantage, it leads to a reduction in the number of possible interpretations, since every proposed interpretation must simultaneously be syntactically and semantically well formed.

If syntactic and semantic processing are combined, the system will be able to detect the semantic anomaly as soon as it interprets the phrase.

The process that transforms the syntactic structure and logical form into a final meaning representation is called contextual processing.

This process includes issues such as identifying the objects referred to by noun phrases such as definite descriptions and pronouns, the analysis of the temporal aspects of the new information conveyed by the sentence, the identification of the speaker's intention as well as the inferential processing required to interpret the sentence appropriately within the application domain.

It uses the knowledge of the discourse context and knowledge of the application to produce a final representation.



The Flow of Information.

The system would then perform whatever reasoning tasks are appropriate for the application.

It uses knowledge of the discourse context, plus information on the grammar and lexicon, to plan the form of an utterance, which then is mapped into words by a realization process.

Knowledge of syntactic structure is encoded in the grammar. This grammar can be used either to identify the structure of a given sentence or to realize a structure as a sequence of words.

A grammar that supports both processes is called a bidirectional grammar.

While most researchers agree that bidirectional grammars are the preferred model.

When the actual grammars differ in understanding and generation, the grammatical formalisms actually used remain the same.

- Syntactic processing is concerned with the structural properties of sentences.
- Semantic processing computes a logical form that represents the context-independent meaning of the sentence.
- Contextual processing connects language to the application domain.

Organizing NLU systems involves structuring the components and processes that enable machines to comprehend and respond to human language.

Input Processing:

Text-preprocessing: clean and preprocess incoming text data by removing noise, handling special characters, and normalizing text.

Tokenization: Break the text into individual tokens for further analysis.

POS Tagging: Identify the grammatical category of each token.
↓
N, V etc.

Syntactic Analysis:

Parsing: Analyze the grammatical structure of sentences to understand the relationships between words. This involves constructing a syntactic tree to graph.

Semantic Analysis:

NER: Named Entity Recognition identify and classify entities such as persons, organizations, locations etc in the text.

SRL: Semantic Role Labeling determine the roles of different entities in a sentence.

Sentiment Analysis:

Determine the sentiment expressed in the text (+ve, -ve, neutral) to understand the emotional tone.

Contextual Embeddings:

Utilize pre-trained language models such as BERT or GPT to capture contextual information and understand the meaning of words in context.

Speech Act Recognition:

Identify the intended action or purpose behind a user's statement.

Intent Recognition:

Determine the user's intention based on the current dialogue content.

Response Generation:

Generate appropriate responses based on the understanding of user input. This can involve language generation models or rule-based systems.

Linguistic Background: An Outline of English Syntax:

Words:

The word is far from the fundamental element of the study in linguistics. It is already the result of a complex set of more primitive parts.

The study of morphology concerns the construction of words from more basic components corresponding roughly to meaning units.

There are two basic ways that new words are formed, traditionally classified as inflectional forms and derivational forms.

Inflectional forms use a root form of a word and typically add a suffix. e.g. verbs.

Each verb has a basic form that then is typically changed depending on the subject and the tense of the sentence.

eg: play, plays, playing, played.

Derivational morphology involves the derivation of new words from other forms.

The new words may be completely different categories from their subparts.

eg: noun = friend

adjective = friendly.

Traditionally linguistics classify words into different categories based on their use.

Two related areas of evidence are used to divide words into categories.

The first area concerns the word's contribution to the meaning of the phrase that contains it.

The second area concerns the actual syntactic structures in which the word may play a role. We can identify 4 main classes of words in English that contribute to the meaning of sentences. These classes are nouns, adjectives, verbs and adverbs.

Sentences are built out of phrases centered on these four word classes.

There are many other classes of words that are necessary to form sentences, such as articles, pronouns, prepositions, particles, quantifiers, conjunctions and so on.

New nouns, verbs, adjectives and adverbs are regularly introduced into the language as it evolves. These classes are called the open class words, and the others are called the closed class words.

A word in any of the four open classes may be used to form the basis of a phrase. This word is called the head of the phrase and indicates the type of thing, activity, or quality that the phrase describes.

eg. Noun phrases

the dog

the mangy dog.

the president of the company looked up the chimney
NP VP

Angry as a hippo

adj phrase

inside the house

adverbial phrase

The Elements of Simple Noun Phrases:

NPs are used to refer to things: objects, places, concepts, events, qualities, and so on.

The simplest NP consists of a single pronoun: he, she, you, they, me, it etc. Pronouns can refer to the physical objects as in the sentence.

Another basic form of noun phrase consists of a name or proper noun such as John. These ~~names~~ nouns appear in capitalized form in carefully written English.

Nouns divide into two main classes:

- Count nouns: that describe specific objects.
- Mass nouns: describe composite substances.

Count nouns acquired their name because they can be counted. There may be one dog (or many dogs), one book (or several books).

If a single count noun is used to describe a whole class of objects, it must be in its plural form.

eg: Dogs are friendly. ✓

Dog is friendly X.

Mass nouns cannot be counted. There may be some water, some wheat, or some sand.

A mass noun can be used to describe a whole class of material without using a plural form.

eg: Water is necessary for life. ✓

Waters are necessary for life X.

A noun phrase may contain specifiers and qualifiers preceding the head.

The qualifiers describe the general class of objects identified by the head, while the specifiers

indicate how many such objects are being described.
Specifiers are constructed out of ordinals such as first and second, cardinals such as one and two, and determiners.

Determiners can be subdivided into the following general classes.

Articles : the, a, an.

Demonstratives : this, that, these, those

Possessives : 's (man's), her, my and whose.

Wh-determiners : which, what.

Quantifying determiners : some, every, most, no, any, both, and half.

A simple noun phrase may have at most one determiner, one ordinal, and one cardinal. It is possible to have all three.

Adjectives : words that attribute qualities to objects yet do not refer to the qualities themselves.

Noun modifiers : mass (or count) nouns used to modify another noun.

Base \rightarrow cry

simple present \rightarrow cries

simple past \rightarrow cried

present participle \rightarrow crying

past participle \rightarrow cried.

The 5 verb forms.

Verb Phrases and Simple Sentences:

While an NP is used to refer to things, a sentence(s) is used to assert, query (or command).

The way a sentence is used is called its mood.

A simple declarative sentence consists of an NP, the subject, followed by a VP, the predicate.

A simple VP may consist of some adverbial modifiers followed by the head verb and its components.

Tense	The verb sequence	Example
Simple present	simple, present	He walks to the store.
Simple past	simple past	He walked to the store.
Simple future	will + infinitive.	He will walk to the store.
Present perfect	have/has + PP	He has walked to the store.
Future perfect	will + have/has + PP	I will have walked to the store.
Past perfect	had + PP	I had walked to the store.
Present progressive	be + pp pre.p	He is walking.
Past progressive	be + pre.p	He was walking.
Future progressive	will + be + pre.p	He will be walking.
Present perfect progression.	have + be + pre.p	He has been walking.
Future perfect progressive	will + have + be + pre.p	He will have been walking.
Past perfect progressive.	have + be(had) + pre.p	He had been walking.

Verbs can be divided into several different classes:

- The auxiliary verbs such as be, do, and have.
- The modal verbs such as will, can, and could.
- The main verbs such as eat, run, and believe.

	First	Second	Third
Singular	I am I walk	You are You walk	he is she walks
Plural	we are we walk	you are you walk	they are they walk.

Transitivity and Passives:

The last verb in a verb sequence is called the main verb, and is drawn from the open class of verbs.

Certain verbs may stand alone with no complement. These are called intransitive verbs.
eg: laugh and run. Jack ran

Another common complement form requires a noun phrase to follow the verb. These are called transitive verbs.

eg: find. Jack ran the machine.

Transitive verbs allow another form of a verb group called the passive form, which is constructed using a be auxiliary followed by the p.p.

Active Sentence	Passive Sentence
Jack saw the ball.	The ball was seen by Jack.
Jack hit me.	I was hit by Jack.
I will find the clue.	The clue will be found by me.

Particles:

Some verb forms are constructed from a verb and an additional word called a particle.

eg: up, out, over and in.

With verbs such as look, take, input, you can construct many different verbs by combining the verb with a particle.

eg: look up, look out, look over and so on.

Look over the paper.

Verb-particle Sentence: I looked it up.

Prepositional Reading: I looked up it.

Clausal Complements:

clauses share most of the same properties of sentences and may have a sub, indicate tense, and in passivized forms.

One common clause form consists of a sentence form preceded by the complementizer ~~that~~ "that".
eg: ^{that} Jack ate the pizza.

Sam knows that Jack ate the pizza.

Sam knows that the pizza was eaten by Jack.

Another clause type involves the infinitive form of the verb.

eg: Jack wishes to eat the pizza.

Jack wishes for Sam to eat the pizza.

Another important class of clauses are sentences with complementizers that are wh-words such as who, what, where, why, whether, and how many.

eg. The police know who committed the crime.

Prepositional Phrase Complements:

Many verbs require complements that involve a specific prepositional phrase.

eg: Jack put the book in the box.

Jack put the book inside the box.

Jack put the book by the door.

The verb "blame" would have a complement form NP + PP (on).

eg: Jack blamed the accident on the police.

Verb	Complement structure	Example.
laugh	intransitive	Jack laughed.
find	NP (transitive)	Jack found a key.
give	NP + PP [to]	Jack gave the book to the library.
reside	location phrase	Jack resides in Rochester.
try	VP [to]	Jack tried to apologize.
tell	NP + VP [to]	Jack told the man to go.
think	NP + APJP	Jack thinks Sue is happy in her job.

Noun Phrases Revisited:

Adjective Phrases:

These more complex adjective phrases are most commonly found as the complements of verbs such as be, seem, follow, the head in a NP.

They generally cannot be used as modifiers preceding the heads of NPs.

eg: The adj. pleased: PP [at]

Jack was pleased with the prize.

eg: angry : PP [at]

Jack was angry at the committee.

Adj phrases may also take a degree modifier preceding the head, as in the adj phrase "very angry."

More complex degree modifiers are possible as in far, too, heavy, and, much, more, desperate.

Adverbial Phrases:

Indicators of degree : very, rather, too.

Location phrases : here, everywhere.

Adverbs may occur in several different positions in sentences : → in the sentence initial position

eg: Then, Jack will open the drawer.

→ in the verb sequence.

eg. Jack will then open the drawer.

→ in the sentence final position.

eg. Jack opened the drawer then.

In addition to these adverbs, adverbial modifiers can be constructed out of a wide range of constructs such as..

→ prepositional phrases indicating, among other things, location (or manner).

→ Noun phrases indicating, among other things, frequency.

→ clauses indicating, among other things, the time.

It is more useful to consider adverbial phrases by function rather than syntactic form. We can consider manner, temporal, duration, location, degree, and frequency adverbial phrases each in its own form.

Temporal adverbials occur in a wide range of forms: adverbial particles (now)

noun phrases (today, yesterday)

prepositional phrases (at noon, during the night)

clauses (before the light started).

Frequency adverbial can occur in a wide range of forms: particles (often)

noun phrases (every day)

prepositional phrases (at every party)

Duration adverbials appear most commonly as prepositional phrases (for three hours, about 20 feet)

Manner adverbials occur in a wide range of forms, including: particles (slowly)

Np (this way)

prepositional phrases (in great haste).

One distinction is that adverbial phrases are always optional.

eg: (1) Jack put the box by the door.

Jack put the box.

(2) Jack ate the pizza by the door.

Jack ate the pizza.

The major phrase structures of English have been introduced - namely, noun phrases, sentences, prepositional phrases, adjective phrases, and adverbial phrases.
