

040020310- Emerging Technologies

Objectives: To provide basics of natural language processing and image processing, so to understand the role of computing in language and image processing domain.

Course Outcomes: Upon completion of the course, students shall be able to

CO1: describe need of speech and language processing along with their applicability.

CO2: use regular expression for characterizing text sequence.

CO3: use Finite State Automata to model the regular expressions.

CO4: use Bayesian model to form non-word spelling errors.

CO5: describe digital image, digital image processing, steps and its applicability.

CO6: describe the concept of spatial and intensity resolution, basic relationships between pixels.

CO7: use tools for basic image processing tasks.

CO8: describes image processing in spatial domain and its applicability.

Unit	No. of Lectures	Topic	Reference chapter/ Additional Reading	Teaching Methodology	Evaluation Parameter
Unit-1 Speech and Language Processing: Introduction(8 Hours)					
1.1	1	Introduction	ST #1 Page no 1-2	Chalk & Talk	
1.2	2	Knowledge in Speech and Language processing	DJ #1-Page no 28-30	Presentation	
1.3	1	Ambiguity	DJ #1-Page no 30-31	Presentation	
1.4	2	Models and algorithms	DJ #1-Page no 31-32	Presentation	
1.5	2	Language, Thought and understanding	DJ #1-Page no 32-35	Chalk & Talk	
Unit-2 Regular Expressions and Automata(8 Hours)					
2.1	1	Regular expression	DJ #2-Page no 47-59 ST #3-Page no 54-59	Presentation	Quiz-1
2.2	3	Finite State Automata	DJ #2-Page no 59-64 ST #3-Page no 59-63	Presentation	
2.3	2	Formal Language	DJ #2-Page no 64-75	Chalk & Talk	
2.4	2	Regular language and FSA	DJ #2-Page no 75-77	Presentation	
Unit-3 Probabilistic models of Spelling(8 Hours)					
3.1	2	Spelling Errors and Error Patterns	DJ #5-Page no 167-172 ST #3 Page no 71-75	Chalk & Talk	Unit Test-1
3.2	1	Detecting non-word errors	DJ #5-Page no 172 ST #3 Page no 76-77	Presentation	
3.3	3	Probabilistic models	DJ #5-Page no 173-175	Presentation	
3.4	2	Applying the Bayesian method to Spelling	DJ #5-Page no 175-182	Presentation	
Unit-4 Image Processing Fundamental(8 Hours)					
4.1	1	Introduction to Digital Image Processing	RR #1-Page no 1-5 DI #1-Page no 1-3	Chalk & Talk	
4.2	1	Examples of Fields that use Digital Image Processing	RR #1-Page no 7-24 DI #1-Page no 42	Discussion	
4.3	2	Component of an Image Processing System	RR #1-Page no 28-30 DI #1-Page no 22-37	Presentation	
Unit-5 Digital Image Fundamentals(8 Hours)					
5.1	1	Fundamental steps in Digital Image Processing system	RR #1-Page no 20-24	Presentation	

5.2	2	Image Sampling and Quantization: basic concepts in sampling and quantization	RR #2-Page no 52-54 DI #1-Page no 4-12	Presentation	Unit Test-2
5.3	3	Representing Digital Images Spatial and intensity resolution Image Interpolation	RR #2-Page no 55-65 DI #1-Page no 13	Presentation	
5.4	2	Basic relationships between pixels	RR #2-Page no 68-72 DI #5-Page no 245-247	Chalk & Talk	
5.5	2	Mathematical tools used in Digital Image Processing	RR #2-Page no 72-97	Chalk & Talk	
Unit-6 Intensity Transformation and Spatial Filtering(8 Hours)					
6.1	1	Introduction to intensity transformation & spatial filtering	RR #3-Page no 104-107	Chalk & Talk	Internal Theory Exam
6.2	2	Intensity transformation functions	RR #2-Page no 107-119	Presentation	
6.3	2	Histogram processing	RR #2-Page no 120-144 DI #5-Page no 248-251	Presentation	
6.4	2	Spatial filtering: Correlation and Convolution, linear filtering, Filter masks	RR #2-Page no 144-152 DI #3-Page no 84-137	Presentation	
6.5	2	Smoothing and sharpening spatial filters	RR #2-Page no 152-172 DI #5-Page no 273-274	Presentation	

Course Outcomes and Programme Outcomes Mapping:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓					
CO2						✓
CO3		✓				✓
CO4				✓		✓
CO5	✓					
CO6					✓	✓
CO7				✓	✓	
CO8					✓	

Activities/Practicum:

The following activities shall be carried out by the students.

1. Study information retrieval with respect to its association with Natural language Processing.
2. Implementation/demonstration of intensity transforms algorithms.

The following activities shall be carried out by the teacher.

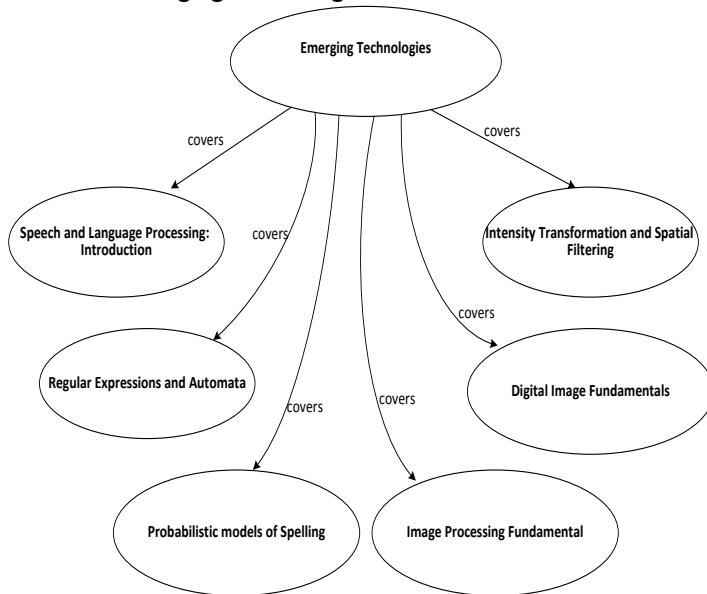
1. Demonstration of Stanford parser.
2. Demonstration of Histogram and its application.

Modes of Transaction (i.e. Delivery)

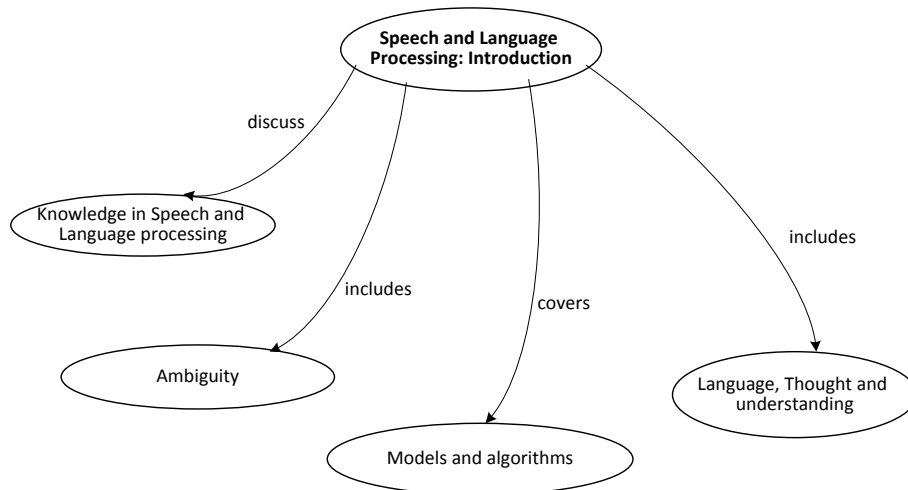
- ❑ **Lecture method** shall be used for all units. For unit 1 and 4 lecture delivery shall be supplemented with audio-visual aids for the topics namely Knowledge in Speech and Language processing, Ambiguity and Fundamental steps in Digital Image Processing system.
- ❑ For unit 2, 3, 5 and 6 hands-on session shall be conducted with emphasis on probabilistic models for spelling errors and tools used for digital image processing.

Concept Map:

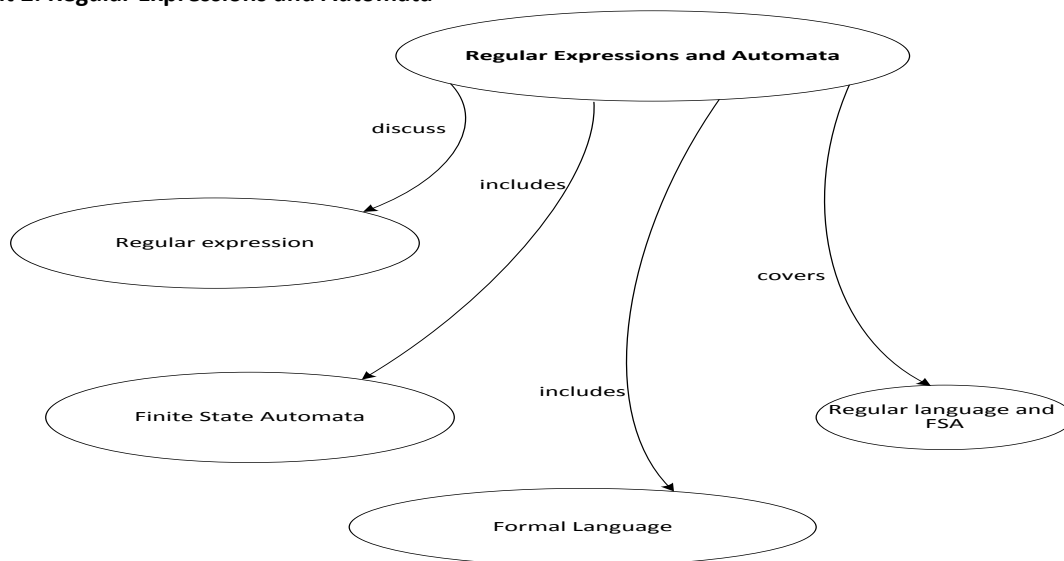
Course Title: Emerging Technologies



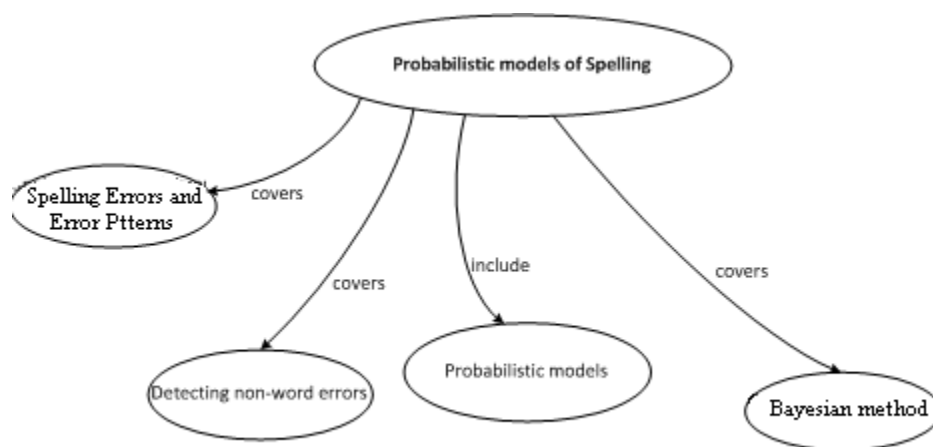
Unit 1: Speech and Language Processing: Introduction



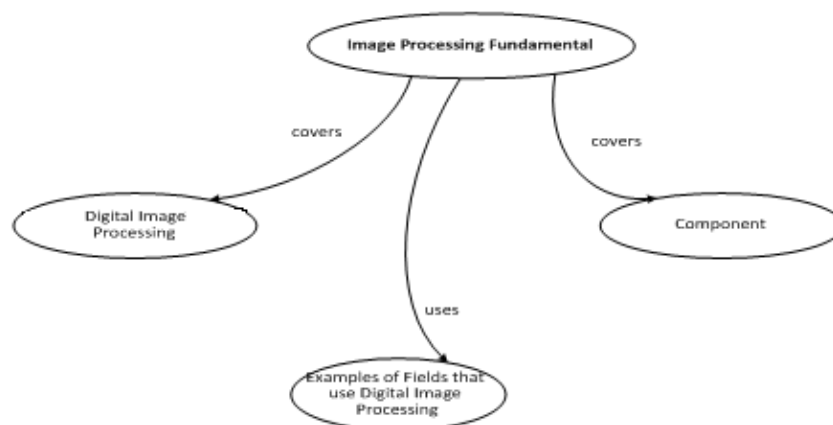
Unit 2: Regular Expressions and Automata



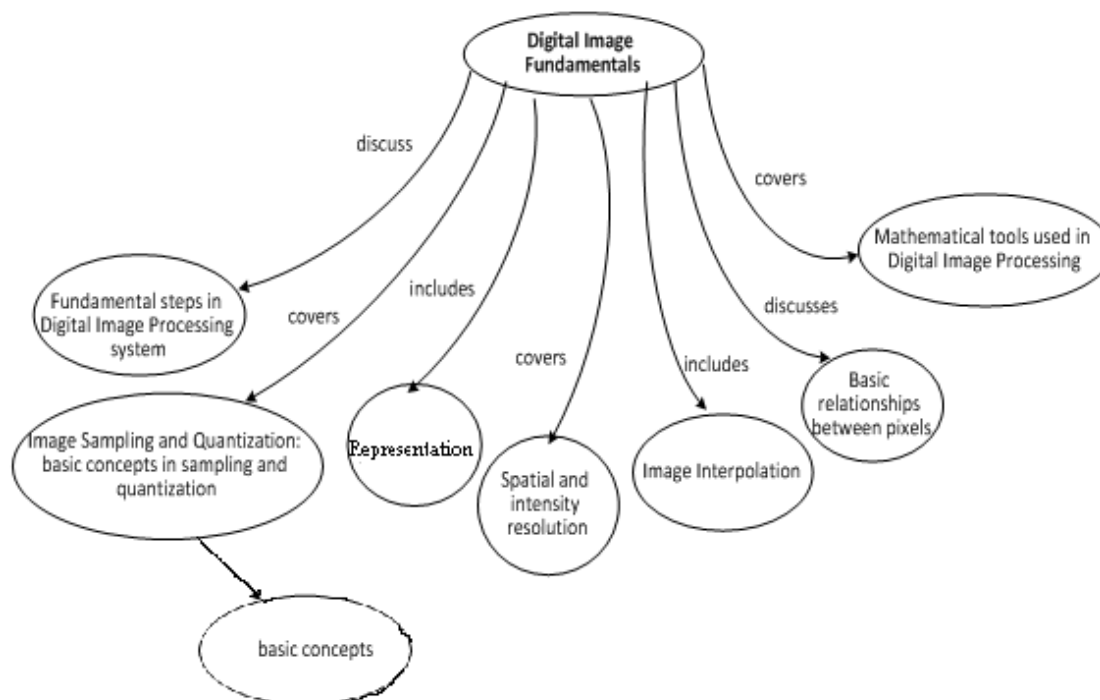
Unit 3: Probabilistic models of Spelling



Unit 4: Image Processing Fundamental



Unit 5: Digital Image Fundamentals



Unit 6: Intensity Transformation and Spatial Filtering

