Knowledge Model

Paper 1's Related Paper 1	• Ontology based, domain specific knowledge base • Ontologies represent semantics of KB and also capture all possible user intents • Methodology to automatically generate entities, intents and training examples from domain specific knowledge bases in a domain agnostic way
Paper 1	• Ontology based knowledge model which allows reasoning driven dialog planning • Knowledge model accepts both verbal and non-verbal user input
Paper 9	• New knowledge extracted from user utterances is added to the knowledge graph. Inferences that can be directly made from the knowledge are also added to the knowledge graph • Conversational knowledge template to hold common sense knowledge for topics which are incorporated in responses

Natural Language Understanding (Domain/Intent Classification, Slot Filling)

Paper 15	• Architecture to parse simple and complex queries to extract information from them
	• Technique can be used for any type of query
	    ○ Which obey slot filling grammar
	    ○ Which obey RNN grammar (parse tree)
	    ○ Which don't obey either grammar

Paper 17	• Architecture for multi-domain dialog state tracking • Dialog state tracking is the prediction of domain, intents, slots given user utterance and conversation history
Paper 12	• Recursive, hierarchical frame based representation of user utterance instead of only intents and slots • Useful for representing more complex queries with many intents and domains in a task oriented CA
Paper 6's Related Paper 2	• Useful for task oriented dialog agents • Model to encode dialog context and using this encoding it has models for 1) Named Entity Recognition 2) Action Prediction (Whether an API call should be made or natural language is to be generated) 3) Slot filling
Paper 10	• Entity resolution features are used to improve reranking of domain, intent, slots
Paper 14	• Design of 2 types of hypothesis rejection modules is proposed (at domain level and overall) • Hypothesis consists of domain, intents, named entities

	• If the hypothesis generated by NLU is wrong then it is better to reject it than act upon it
Paper 9	• Method 1: Semantic Parsing of user utterances. Information is extracted from user utterance and an inference is made to obtain new knowledge from it • Method 2: Models for intent and topic classification, entity recognition, punctuation insertion
Paper 2	• Question type classification for a question answering system • Intent classification to find the intent of the question
Interesting Paper 4	• Technique for fast intent classification on low complexity devices

Dialog Manager

Paper 11	• Dialog policy for knowledge grounded, open domain systems • Policy can be used to condition the neural response generators so that they produce controlled responses in terms of style and content
Paper 4	• Technique for target guided, open domain conversations • Technique can be used to generate keywords for responses to produce smooth transitions to a different topic • Aim is to guide conversation towards a target
Paper 4's Related Paper 1	• Similar to Paper 4 • Differs from Paper 4 in that it doesn't consider semantic knowledge relations between keywords, which leads to poor topic transitions • Also differs in that it has a discourse level target guided strategy in which a keyword may be selected but may not be used in the response
Paper 13	• Technique for improving skill routing on infrequent but critical intents • Intents, slots, user utterance, context are given to the model, which picks the correct skill to execute
Paper 16	• Fine tuning technique of transformers to improve their performance on answer sentence selection • Answer sentence selection is the selection of an answer given a question and a set of candidate answers • Paper says that proposed fine tuning technique can be applied for any natural language task but they give models and perform experiments only for answer sentence selection

[Paper 2]	• Models for semantic matching of user question with candidate question-answer pairs to find closest match • Finite state machine dialog manager used to proactively query user for missing slots

Natural Language Generation

[Paper 3]	• Technique for building persona based conversational agents using persona specific conversational data of any kind • Used to generate responses with consistent persona, consisting of speaker role, domain of expertise and speaking style
[Paper 9]	• Method 1: Rule based response generation by extracting knowledge from knowledge graph and then using dynamic language templates to generate a response which reacts to user utterance and gives novel information • Method 2: Model for neural response generation trained on conversations gathered from other agents. Methods to control empathy and topic of responses

Non Verbal Output for Embodied Conversational Agent

[Paper 7]	• Technique for generating non-verbal communication of agent • Uses intents and entities in user utterance to model the base animation and uses the defined persona to produce movement • Techniques involve facial expression and hand gesture generation
[Paper 1's Related Paper 2]	• Holistic model of modality selection that dynamically assigns modalities to responses based on semantic and contextual meaning of the response and the profile of the user being addressed • Modality selection and instantiation are separated from synchronization and are done by using XML-like rules

Knowledge Extraction/Dataset Creation

[Paper 6] [Paper 6's Related Paper 1]	• Technique to rapidly develop labelled dialogue datasets which can be used to develop goal oriented chatbots in any arbitrary domain • Developer must provide possible intents and slots • Requires some human annotation

Paper 6's Related Paper 2	• Technique to develop goal oriented datasets • Developer needs to specify seed dialogues and natural language equivalents of API calls/returns • Differs from Paper 6 in that it 1) Generates more simulated data for the goals in the seed dialogs instead of random sampling of goals and 2) Technique does not require any knowledge of the purpose of API calls it makes
Paper 20	• Technique for generating controlled datasets for task oriented dialog agents • Technique can be specifically applied to create challenge datasets, which can test particular capabilities of the CA thereby increasing interpretability • The basic technique is similar to Paper 6 but differs in that 1) Specific manipulations are given to create challenge datasets instead of a general task oriented dataset and 2) Paper 20 says that its method uses less human annotation than Paper 6
Paper 8	• Technique for generation of datasets for intent classification • Conversational logs are mined and intents are discovered • Discovered intents require some manual labelling after which the remaining are automatically labelled
Paper 5	• Method for automatic knowledge extraction of a pre-existing chatbot

Evaluation of CAs

Paper 19	• Paper shows that perplexity (an automatic metric) correlates well with human judgement • A neural model trained to optimize perplexity can produce human like responses