

Meena: a Conversational Agent that Can Chat About...Anything

Towards a Human-like Open-Domain Chatbot

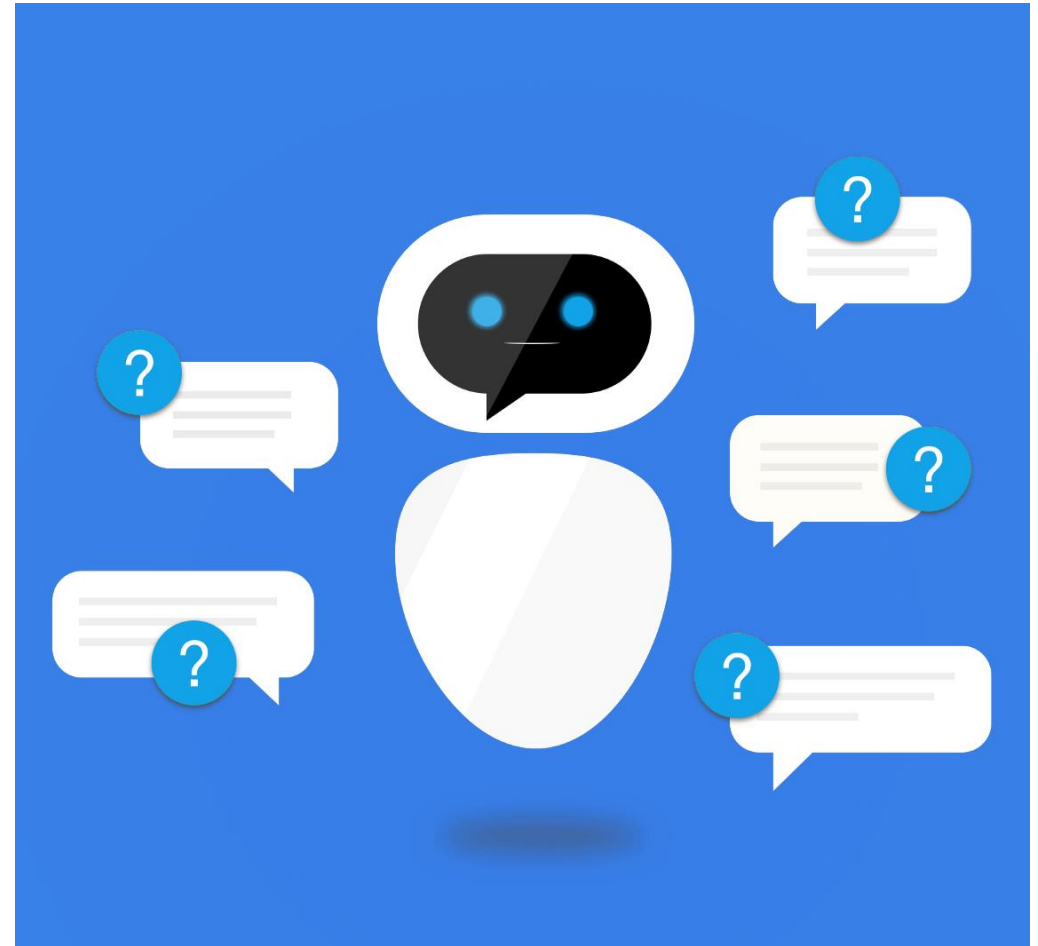
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Meena model

- Chatbot – a piece of software or machine learning algorithm that we can talk to
- Open-domain – we can talk with it on any topic: hotels, weather, music, etc.
- Humanizing computer interactions, improving foreign language practice, and making relatable interactive movie and videogame characters.



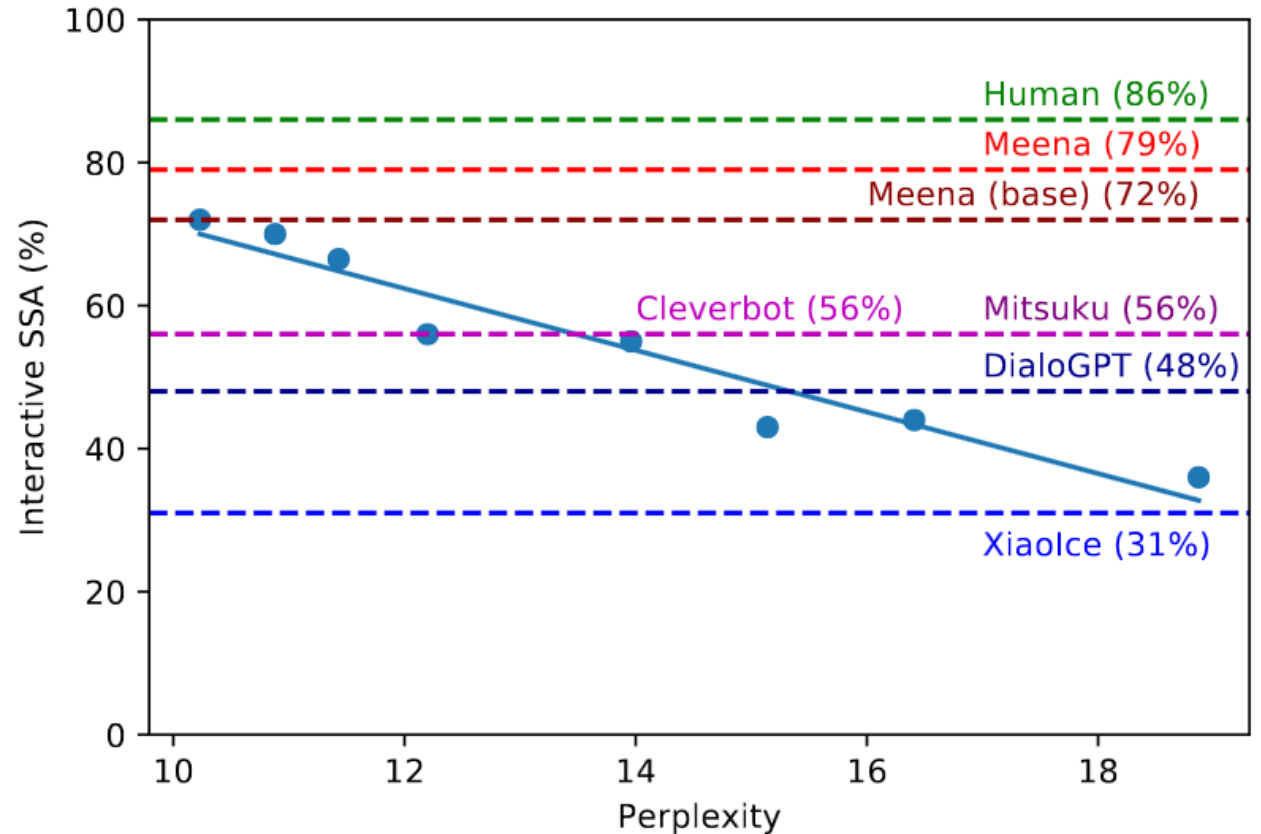
Meena model

- Single Evolved Transformer encoder block
- 13 Evolved Transformer decoder blocks
- 2.6 billion parameters
- 341 GB of text, filtered from public domain social media



Sensibleness and Specificity Average (SSA)

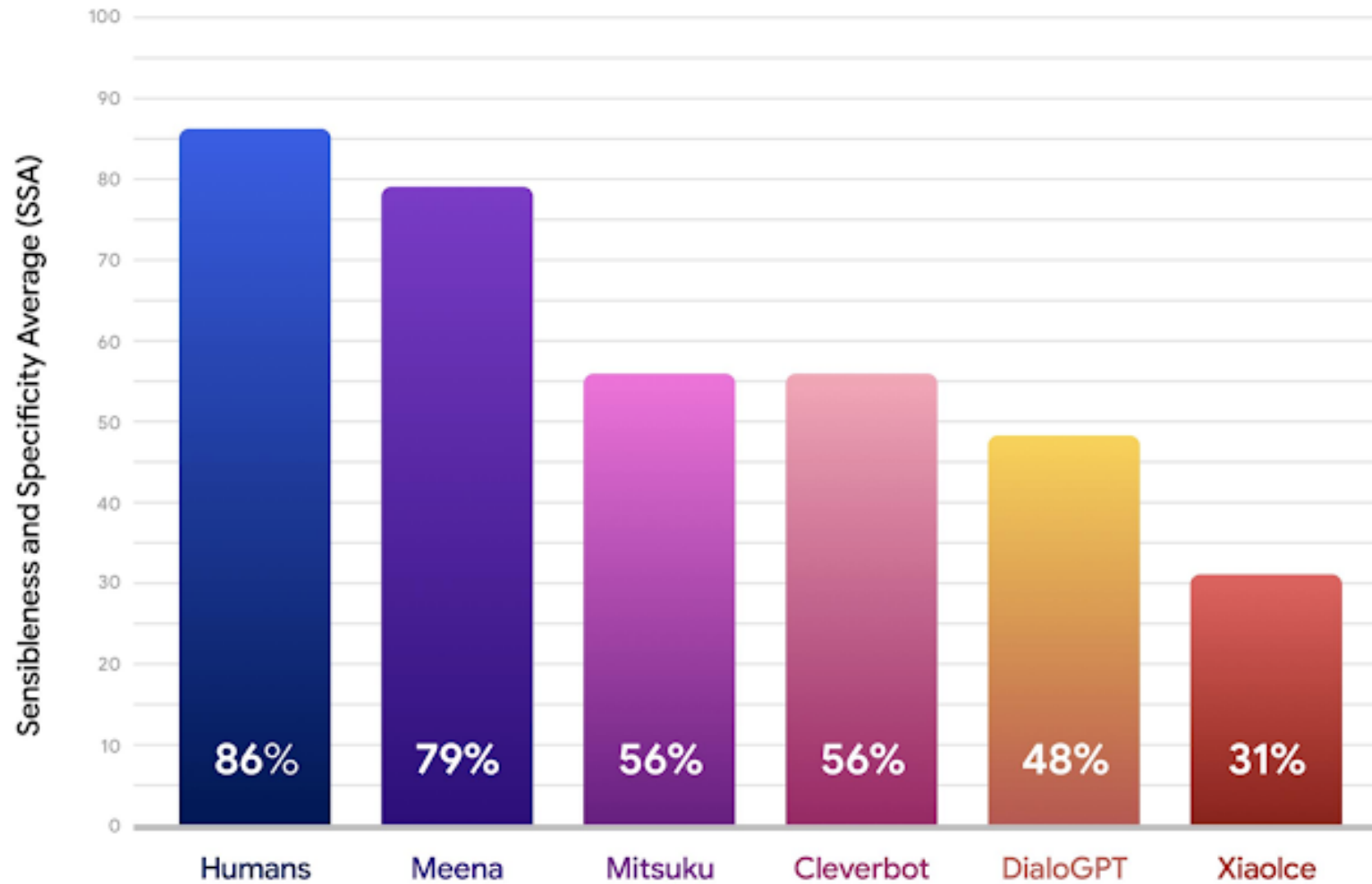
- Making sense
- Being specific
- Highly correlated with models perplexity and human likeness



Perplexity measures how well the model predicts the test set data; in other words, how accurately it anticipates what people will say next. When interpreting perplexity scores, bear in mind that lower is better and that the theoretical minimum is one.

Sample Contexts	Meena (base)	Cleverbot	DialoGPT
A: You must have read a lot of books B: Oh wow, how do you know? Do I look nerdy? A: Of course, you're not!	B: So how do you know? [sensible: 1, specific: 1]	B: Never. said I was. [sensible: 0, specific: 0]	B: Oh thank goodness. [sensible: 1, specific: 1]
A: You know nothing, Jon Snow! B: You must be a fan of Game of Thrones A: Haha yea, how can I not?	B: Who's your favorite character? [sensible: 1, specific: 1]	B: What do you mean? [sensible: 0, specific: 0]	B: You can't. But that's not why you shouldn't know. [sensible: 0, specific: 0]
A: What is your favorite island in the world? B: I would say Fiji A: Interesting, what's nice about it?	B: Just a beautiful place [sensible: 1, specific: 0]	B: The title is self explanatory. [sensible: 0, specific: 0]	B: You can see some great scenery. [sensible: 1, specific: 0]
A: You must have read a lot of books B: Oh wow, how do you know? Do I look nerdy?	A: I know because I've read a lot of books. [sensible: 1, specific: 1]	A: Observation. [sensible: 1, specific: 0]	A: I know because you look like your mom. [sensible: 1, specific: 1]
A: You know nothing, Jon Snow! B: You must be a fan of Game of Thrones	A: Yeah, I'm reading the books at the moment. [sensible: 1, specific: 1]	A: No. [sensible: 1, specific: 0]	A: I've never really been interested in it... [sensible: 1, specific: 1]
A: What is your favorite island in the world? B: I would say Fiji	A: Fiji, yes! I've been there once. It's the most beautiful place I've ever been. It definitely makes me want to move there. I hope you get to visit again soon! [sensible: 1, specific: 1]	A: I would have guessed 666. [sensible: 0, specific: 0]	A: Fiji is awesome! But I would say Fiji and Oceania are more popular at the moment. [sensible: 0, specific: 0]

Meena model



Examples

Conversation B

Human: *Hi!*
Meena: *Hi! How are you this fine evening?*
Human: *I'm doing well. it's morning my time!*
Meena: *Good morning! What are your plans for today?*
Human: *Get my work done then watch a movie at home in the night*
Meena: *Sounds fun! What movie?*
Human: *I haven't decided yet, perhaps an Oscar-nominated one. any suggestion?*
Meena: *I'm not too familiar with recent Oscar winners, but I do know I wanted to see The Grand Budapest Hotel.*
Human: *ah, tell me about that movie!*
Meena: *It's from the same director and writer as Moonrise Kingdom. Wes Anderson is pretty well known for making funny, colorful films. I've heard it's pretty good.*
Human: *ha! I've searched on the internet and both movies are very colorful!*
Meena: *I'm looking forward to it. I love colorful movies.*

The Grand Budapest Hotel and Moonrise Kingdom are indeed colorful movies, directed by Wes Anderson.

Examples

Conversation C

Human: *Haha, I think mathematics has a presence beyond human existence.*

Meena: *So does philosophy.*

Human: *Can you state with examples how this is true.*

Meena: *Can you state how it isn't?*

Human: *Without human existence there will be no one left to comprehend whats right whats wrong, and thus philosophy wi [sic]*

Meena: *That's not the definition of philosophy.*

Human: *Without human existence there will be no one left to comprehend whats right whats wrong, and thus philosophy will not be needed. How do you define philosophy?*

Meena: *The study of general knowledge or the fundamental nature of things.*

Meena tries to define philosophy.

Examples

Conversation D

Human: *I like how cute cows are*

Meena: *Ah, interesting. You like how they are cute, right?*

Human: *yeah, and they're really smart*

Meena: *I heard they go to college*

Human: *cows go to college?*

Meena: *I heard that a cow went to Harvard.*

Human: *what did the cow study?*

Meena: *Bovine sciences.*

Human: *do horses go to Harvard?*

Meena: *Horses go to Hayvard.*

Human: *that's a pretty good joke, I feel like you led me into it*

Meena: *You were trying to steer it elsewhere, I can see it.*

Meena executes a multi-turn joke in an open-domain setting. We were unable to find this in the data.

Limitations

- Preserves context only of 7 dialog turns
- Have no basic knowledge
- Sometimes it repeats :)

Cross-turn Repetition Example 2

Human: *Hi!*
Meena: *Hey there! How are you doing?*
Human: *not well, i'm quite depressed*
Meena: *That's no good. Wanna talk about it?*
Human: *not really, it'll only make it worse...can you cheer me up?*
Meena: *Sure! What's got you down?*
Human: *I'd love to hear a really lame joke*
Meena: *How about this one? What did the farmer say when he lost his tractor? Where is my tractor?*
Human: *haha that was lame! where did you hear it?*
Meena: *I was at the mall and I heard it in the food court. How was your day?*
Human: *wow, i didn't know you could walk!*
Meena: *Why did the scarecrow win an award?*
Human: *i don't know..you tell me!*
Meena: *Because he was outstanding in his field!*
Human: *haha, where did you hear that?*
Meena: *I was in the food court and I heard it in the field!*
Human: *you have a great sense of humor!*
Meena: *Why did the chicken cross the road? He was outstanding in his field!*
Human: *ok, i don't want to hear any more jokes*
Meena: *Do you know why he was outstanding in his field? Because he was a chicken!*
Human: *haha looks like you're really into this discussion!*
Meena: *Yes! I am! Do you know why? Because he was outstanding in his field!*
Human: *haha, borderline creepy but still funny :D*
Meena: *Why was the mouse trapped in the bag? Because he was outstanding in his field!*
Human: *i think i broke you*
Meena: *Do you know why I broke you? Because you were outstanding in your field!*

Main achievements

1. Proposing a simple human evaluation metric for multi-turn open-domain chatbots that captures basic, but important, attributes of human conversation
2. Showing evidence that perplexity is an automatic metric that correlates with human judgment, in contrast to recent findings on other automatic metrics mentioned above
3. Demonstrating that an end-to-end neural model with sufficiently low perplexity can surpass the sensibleness and specificity of existing chatbots that rely on complex, handcrafted frame-works developed over many years

Human: Thanks for your attention!

Meena: Happy to help with all of my 32
attentions!

