Techniques to personalize conversations for virtual assistants

Please reach out to info@voicy.ai for any of your needs.

**AI/ML/DL/DRL** consulting (Est: 2015, 10 patents)

**Chatbot:** eCommerce, Physical Retail, Banking Assistant

**Search:** Search Ranking, Query Understanding

**Conversational Search:** eCommerce Mobile App

**Vision:** Fashion outfits, Similar Dresses

**Machine Learning:** Forecasting, Fraud detection

**Deep Learning:** Personalization, Ranking

**Deep Reinforcement Learning:** Pricing, Marketing

**Vision QA:** Robotics

**Imitation Learning:** Digital Twins on Devices
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Personalization is:

a process that changes the functionality, interface, information access and content, or distinctiveness of a system to increase its personal relevance to an individual or a category of individuals:

Marketing/e-commerce
a. “Personalization is the combined use of technology and customer information to tailor electronic commerce interactions between a business and each individual customer”
b. “Personalization is about building customer loyalty by building a meaningful one-to-one relationship; by understanding the needs of each individual and helping satisfy a goal that efficiently and knowledgeably addresses each individual’s need in a given context”
c. “Personalization is the capability to provide users, customers, partners, and employees, with the most relevant web experience possible”
d. “Personalization is any behaviors occurring in the interactions intended to contribute to the individuation of the customer”
e. An enterprise, process, or ideology in which personalized products and services are integrated and implemented throughout the organization including all points of sale; other points of customer contact; and back-end activities and departments such as inventory, shipping, production, and finance.

Cognitive science
f. Personalization is “a system that makes explicit assumptions about users’ goals, interests, preferences and knowledge based on an observation of his or her behavior or a set of rules relating behavior to cognitive elements”.
g. Personalization is the process of providing relevant content based on individual user preferences or behavior
h. Personalization is the “explicit user model that represents user knowledge, goals, interests, and other features that enable the system to distinguish among different users”
i. Personalization is the understanding of “the user, the user’s tasks, and the context in which the user accomplishes tasks and goals”

Social science
j. Technology that reflects and enhances social relationships and social networks.
k. “Technology that provide experiences that bridge cultures, languages, currencies, and ideologies”

Computer science
l. “Personalization is a toolbox of technologies and application features used in the design of an end-user experience”
m. Personalization system is any piece of software that applies business rules to profiles of users and content to provide a variable set of user interfaces”
n. Machine-learning algorithms that are integrated into systems to accommodate individual user’s unique patterns of interactions with the system.
o. “Computer networks that provides personalized features, services and user interface portability across network boundaries and between terminals”
p. Unifying platform embedded in any type of computing devices that support individualized information inflow and outflow.
q. Presenting customers with services that are relevant to their current locations, activities, and surrounding environments.
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Chatbot with high extraversion:
- focus on social talk (e.g. chit-chat)
- high use of exclamation marks
- usage of emojis

Chatbot with low extraversion:
- focus on task at-hand (e.g. no chit-chat)
- moderate use of exclamation marks
- no emojis
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### Design Paradigms:

<table>
<thead>
<tr>
<th>Architectural</th>
<th>Instrumental</th>
</tr>
</thead>
<tbody>
<tr>
<td>form and function</td>
<td>functionality and usability</td>
</tr>
<tr>
<td>Relational</td>
<td>Commercial</td>
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<tr>
<td>meaning</td>
<td>content</td>
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<tr>
<td>Affective</td>
<td>Utilitarian</td>
</tr>
<tr>
<td>Individual</td>
<td>Interactional</td>
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</tbody>
</table>

Figure 1. Personalization design paradigms.

### Implementation: What, Whom, and Who?
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**What:** Content, User interface, Delivery channel, and Functionality
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**What:** User Interface

MultiModal Dialog Systems: High commercial value

**Challenges:**

1) automatically generate the right responses in appropriate medium forms;
2) jointly consider the visual cues and the side information while selecting product images; and
3) guide the response generation with multi-faceted and heterogeneous knowledge.
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What: User Interface

Hi, there.

Greetings

Hello, what I can help you with today?

General response

I am keen on buying floaters made in TPR suede leather for myself, just like this one.

Give criteria

Good! let me take a quick scan through my catalogue.

Multimodal response

Regarding the 4th one, flaunt an effortless look as you adorn this pair of sandals by Bacca Bucci ...

Ask for style-tip

Will T-shirt complement any of these?

Yes, T-shirt will go well with these sandals.
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What: User Interface
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**Whom:** individual or a user group

A chatbot needs to present a coherent personality to gain confidence and trust from the user. Some features are:

**Agreeableness:** cheerful, trusting, amiable, humble, polite, helpful

**Extroversion:** affectionate, friendly, fun-loving, confident

**Conscientiousness:** reliable, consistent, perceptive

**Openness:** insightful, original, clever, daring

**Neuroticism:** no traits
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Whom: User Modeling via Stereotypes

Figure 2. A Piece of the Stereotype DAG.
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Whom: Personality Match Modelling
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**Whom:** Personalized Adaptation using Transfer Learning

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**Figure 1:** The flowchart of the proposed PETAL system on the coffee-ordering task.
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Whom: Face to Face Conversation (https://vimeo.com/248025147)
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Who: Implicit and Explicit, Data Pipeline
Conclusion:
Personalization more important to ensure engagement
Big commercial implications
Quickly evolving space
Great research challenges in Personalized Unconstrained Natural Language, Multi Modal Interactions, and Personalized Avatars.
Great System challenges: Real time personalization pipeline
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References:

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Recommendations in Dialogue Systems: Thesis (https://escholarship.org/uc/item/4rs1s3ms)
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Top AI Research papers. (https://www.topbots.com/most-important-conversational-ai-research/)
A Face-to-Face Neural Conversation Model (https://arxiv.org/abs/1812.01525)
Advanced techniques to improve content presentation experiences for businesses and users (https://patents.google.com/patent/US2019013909A1)
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**What**: Emotion Detection

![Diagram](image)

**Fig. 5** Hierarchical architecture for extracting context-dependent multimodal utterance features [81].
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What: Personalized avatars