AWS re:Invent

AIM349

Build a hotel recommender with Amazon Personalize—no ML skills needed

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AWS re:Invent

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Agenda

- Challenge of a hotel recommender
- Why the hierarchical recurrent neural network (HRNN) and Amazon Personalize?
- How to build a hotel recommender
- How HRNN works
- Alternative approaches

About me

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About me: Pavlos Mitsoulis-Ntompos

https://aws.amazon.com/developer/community/heroes/pavlos-mitsoulis/



- AWS ML Hero & Staff Data Scientist at Vrbo, part of Expedia Group
- Leading machine learning initiatives for growth marketing at Vrbo
- Co-creator of Sagify, an open-source CLI tool for Amazon SageMaker
- Author of the Packt video course “Hands-On Machine Learning Using Amazon SageMaker”
- Main interests: Personalization, recommender systems, search/ranking, and ML platforms
- @PavlosMitsoulis

Quick show of hands before we start …

- ✓ Do you have recommendation use cases in your business?
- ✓ Have you used or are you currently using recommender engines?
- ✓ Do you know what a recurrent neural network (RNN) is?
- ✓ Have you used or are you currently using Amazon Personalize?



Motivation & challenge

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Challenge

- ✓ Help users by providing them a personalized experience given the following constraints:
  - Users don’t purchase (i.e., book) as often on this platform as on other ecommerce platforms
  - Context for each trip might be different within and across different seasons and destinations (e.g., winter trip to mountains with friends, summer trip to the beach with family)
  - Budget is not always the same for the same traveler

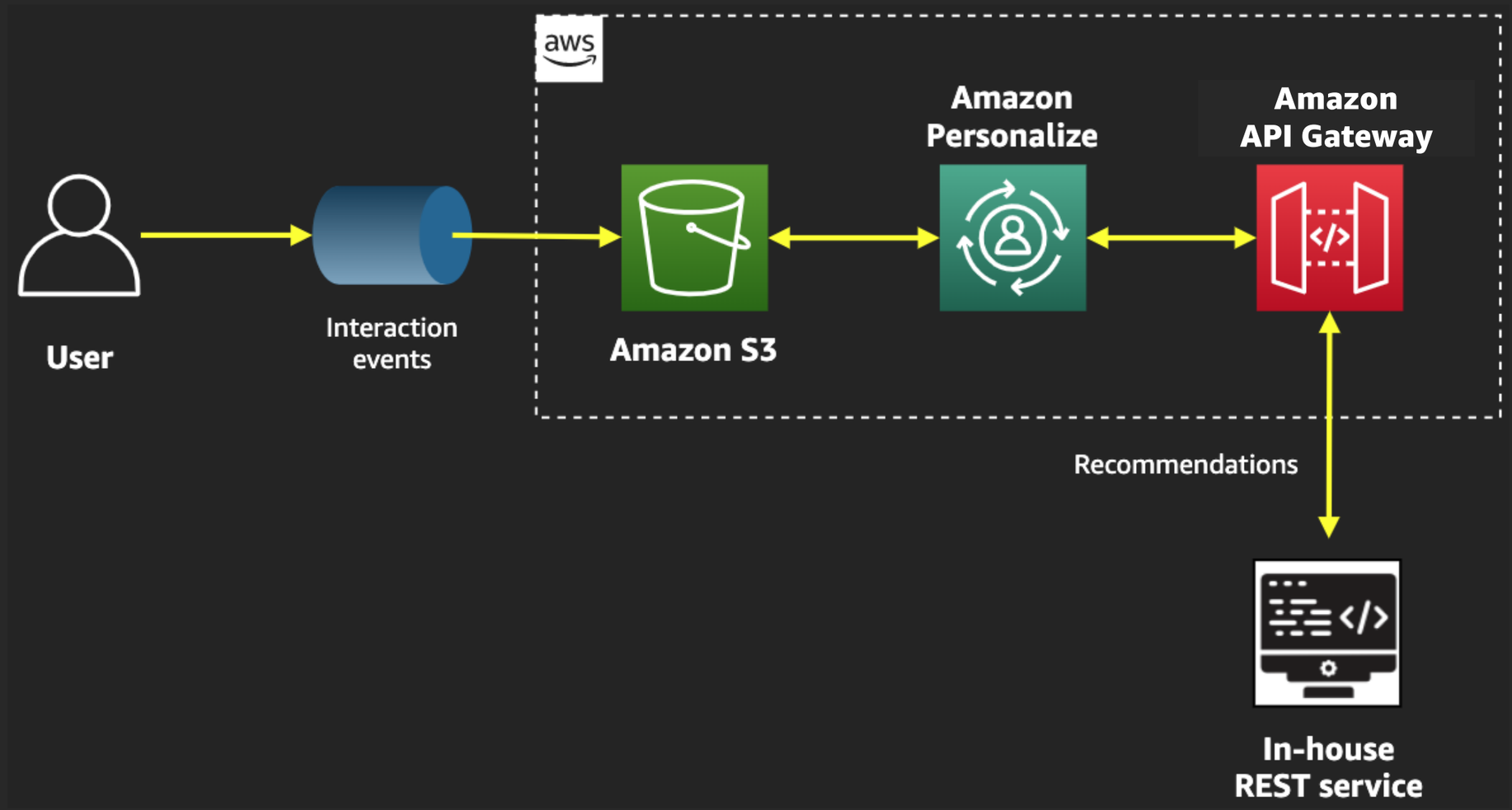
Why Amazon Personalize?

- ✓ High-quality recommendations and support for the HRNN algorithm and others
- ✓ Real-time recommendations (interaction events)
- ✓ Support for all channels and devices
- ✓ Quick personalization models with just a few clicks

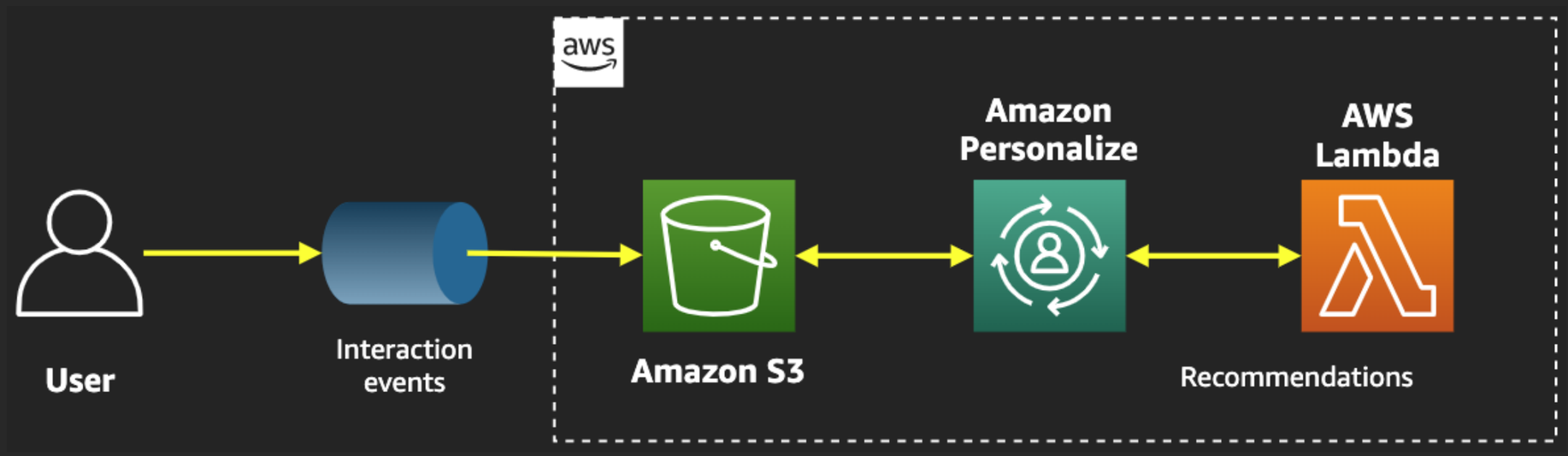
Demo

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Architecture (1)



Architecture (2)



What is a hierarchical recurrent neural network (HRNN)?

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Paper

“Personalized Session-based Recommendations with Hierarchical Recurrent Neural Networks,” M. Quadrana, A. Karatzoglou, B. Hidasi, P. Cremonesi (ACM: RecSys 2017)

https://arxiv.org/pdf/1706.04148.pdf

What problem do the authors solve?

- In session-based recommenders, recommendations are provided based only on the visitor's interactions in the current session
- But there are cases (such as this one) where a visitor can be logged in or there are other forms of identifiers (cookies)
- How can "signals" be propagated from "recent" sessions to the current one?

HRNN algorithm in simple words

- Learns a representation embedding from “recent” sessions to inform the current one
- If you’re planning a ski holiday, you have probably searched in previous recent sessions for hotels in places such as the French Alps and viewed hotels in ski areas
- So the algorithm boosts hotels in ski areas in the current session

HRNN algorithm

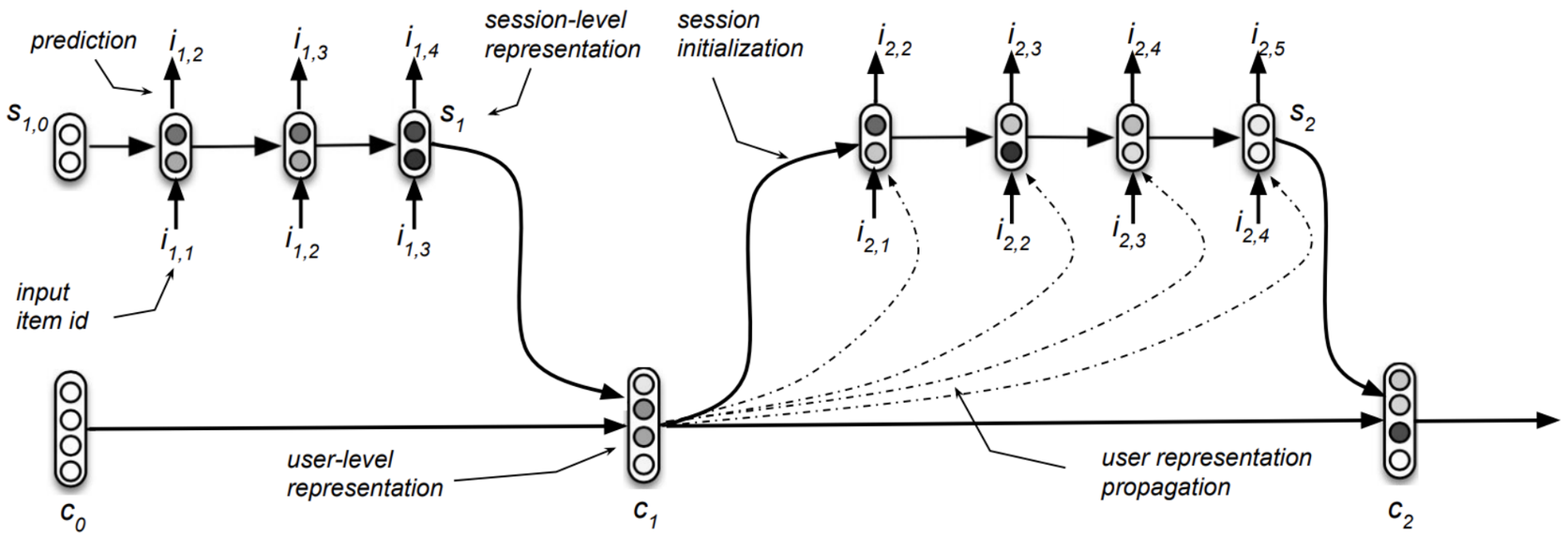


Figure 1: Graphical representation of the proposed Hierarchical RNN model for personalized session-based recommendation. The model is composed of an hierarchy of two GRUs, the session-level GRU (GRU_{ses}) and the user-level GRU (GRU_{usr}). The session-level GRU models the user activity within sessions and generates recommendations. The user-level GRU models the evolution of the user across sessions and provides personalization capabilities to the session-level GRU by initializing its hidden state and, optionally, by propagating the user representation in input.

What about the Vacation Rental industry?

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Another challenge

- Number of vacation rentals added onto your website keeps growing rapidly



Motivation

- Then use the HRNN-Coldstart recipe!
  - An item is considered a cold item when it has the following:
    - Fewer interactions than *cold_start_max_interactions*
    - A shorter relative duration than *cold_start_max_duration*

Demo

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Alternative approaches

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Remember …

- Amazon Personalize provides an **easy way** to build an **accurate** recommender for different scenarios with **minimal ML knowledge**
- Additionally, it solves all the engineering challenges related to training and serving recommendations
- Further, it offers proprietary implementations and optimizations that can be tested across multiple domains
- SIMS algorithm helps with item-item personalization
- However, if you want to have more **control** over the algorithm …

Amazon SageMaker + (LightFM or Spotlight)

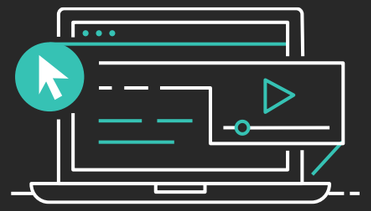
- Amazon SageMaker provides an easy way to train and host your **custom** models
- LightFM and Spotlight are 2 great libraries that provide a Python API to train recommender models based on state-of-the-art methodologies
- And they give you the ability to make adjustments in the algorithmic part
- https://github.com/lyst/lightfm and https://github.com/maciejkula/spotlight

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Thank you!

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