Migrating to chatbot
-- Madhu Gopinathan
-- Sanjay Mohan
MakeMyTrip: India’s One Stop Travel Shop

Flights  Hotels  Holidays  Bus  Cabs  Trains  Gift Cards  Experiences  Visa  Homes

40 million customers
Evolution of Customer Support

IVR

Write to us
Timeline of refund status

Oct 10: Rescheduled my flight directly with airline

Oct 16 – Night: When will I get my refund?

Oct 17 – Agent 1: Your phone is unreachable

Oct 18 – Night: Call me after 7 pm

Oct 18 - Agent 1: Called at 7.40 pm. Still unreachable

Oct 21: I will sue you. Where is my refund?

Oct 21 - Agent 2: Refund has been issued on 21st. 3-5 days for credit

Oct 25: I am really pissed!

Oct 25 - Agent 2: We assure you that refund has been issued

Oct 26: Ok. Got it. Thanks
Evolution of Customer Support

- IVR
- Chat bot
- Write to us
Evolution of Customer Support

IVR

Chat bot

Write to us
Refund Related Issues

Refund Query
If I cancel, how much refund will I get?

Refund Status
When can I expect to get the refund?

Refund Calculation Logic
Explain how you determined the amount to be refunded

Refund Delayed
I have been waiting for too long

Refund Special Claim
- Flight was cancelled
- Flight itinerary changed
Deal with WhatsApp Lingo?

Hello how to cancel ✓

Father won’t travel with us. Please cancel his ticket ✓

Maine flight ticket cancel ki thi, us me se kitna amount cut hoga? ✓

Refund when? 😡 ✓

Want to book a flight for Kolkata early morning ✓

Can I change name? ✓

May refund ishu kab tak aayega kitna ayega ✓
Issue Types: *Fat head*, *Chunky middle* and *Long tail*

- Fat head
  - Chunky middle
  - Long tail
- Late check-in request
- Meal Included?
- Terminal details
- Cancel due to medical emergency
- Train delayed by more than 3 hours
- Claim travel insurance
- Refund discrepancy
- Extra charges at hotel
- Buy insurance

20-30% of issue volume
Business Impact

~10K Customers / Day

~12K Chats / Day

2m Total Customers Served

~80% Chats Handled by Bot

80% Bot CSAT / Agent CSAT

7% Remaining volume that Bot could handle
Architecture / NLU Model
Interactions

User
Touch
Type
Speak
Speech To Text

Myra App
Request(text input)

Dialog Manager
Get Intent

Intent Classifier
Invoke Action

APIs
Respond
Interactions

User

Myra App

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Respond
Hi, I am Manoj!
I want to know about my booking NH7P51485842508

05 Feb 19, 19:34:19

**MYRA**
What can I help you with?

---

**Ready For Stay**
- View booking details →
- Get directions to hotel →
- Call hotel →
- View documents to carry →
- Get confirmation voucher →

---

**On Trip**
- Write hotel review →
- Problems during check-in? →
- Connect me with an agent since my issue is urgent!
- View inclusions and amenities →

---

**Payment And Invoice**
- View amount paid/pending →
- Get invoice →
- View breakup of price →
- Get GST Invoice →

05 Feb 19, 19:34:22
Below are the charges if you cancel fully:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Paid</td>
<td>₹ 0</td>
</tr>
<tr>
<td>Total Cancellation Charges</td>
<td>₹ 0</td>
</tr>
<tr>
<td>Cancellation Charges</td>
<td>₹ 0</td>
</tr>
<tr>
<td>TOTAL REFUND</td>
<td>₹ 0</td>
</tr>
</tbody>
</table>

CONFIRM CANCELLATION

05 Feb 19, 19:35:01
Your cancellation is successful! To know more about your refund, please choose one of the below options.
Frame Based State Tracker

Frame

Slot 1

Slot 2

Slot 3

Speech and Language Processing by Jurafsky & Martin
Chapter 24: Dialog Systems and Chatbots
Frame Based State Tracker

Frame

Booking ID | Cancellation | Confirmation

Show Charges

confirm = Y

Do Cancel

success

Show Result

Speech and Language Processing by Jurafsky & Martin
Chapter 24: Dialog Systems and Chatbots
Interactions

User
- Touch
- Type
- Speak

Myra App
- Speech To Text

Dialog Manager
- Get Intent
- Invoke Action

Intent Classifier
- Pl cancel booking
  MMT.Cancellation.FullCancellation

APIs

Request (text input)
Intent Classifier

- Label Data
- Train Model
- Evaluate Model
- Deploy
- Monitor
Labelling Text Data

- Write to us Corpus
- Chat Corpus

1. Analyse Data
2. Define Frame
3. Collect Samples
4. Label Samples
5. Check

PI cancel booking
MMT.Cancellation.FullCancellation

Labelled

Tedious
Sequential Transfer Learning

- **General Domain Corpus**
- **Write to us**
- **Labelled**

1. **Pretrain Language Model**
   - English Language Representations
2. **Fine-tune Language Model**
   - MMT Customer Support / Hinglish Representations
3. **Fine-tune Intent Classifier**
   - Intent Specific Representations
4. **Evaluate Model**
   - Micro F1-score increased from 0.80 to 0.89
   - Baseline: CNN + GloVe

Build Intent Classifier with smaller amounts of labelled data
**ULMFiT:** Pretrained Language Model vs. Fine-tuned Language Model

Embedding Layer → LSTM 1 → LSTM 2 → LSTM 3 → Softmax Layer

- new >
- new **new york city is the only**
- new **new delhi to mumbai flight**
- i want >
- i want **to be a real person**
- I want **to change my email to**
- kitna >
- kitna ?
- kitna **refund amt refund hoga**

*Universal Language Model Fine-tuning for Text Classification*
Jeremy Howard, Sebastian Ruder
ULMFiT: Pretrained Language Model vs. Fine-tuned Language Model

- Pretrained on WikiText-103
  - Consisting of 28,595 preprocessed Wikipedia articles (103 million words)

- Fine-tuned on customer support corpus (~10 m words)

Universal Language Model Fine-tuning for Text Classification
Jeremy Howard, Sebastian Ruder
ULMFiT: Pretrained Language Model vs. Fine-tuned Language Model

- Embedding Layer
- LSTM 1
- LSTM 2
- LSTM 3
- Softmax Layer

Catastrophic Forgetting

Discriminative Fine Tuning
- Different layers capture different types of information
- Fine-tune each layer with different learning rates

Universal Language Model Fine-tuning for Text Classification
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ULMFiT: Pretrained Language Model vs. Fine-tuned Language Model

Embedding Layer

LSTM 1

LSTM 2

LSTM 3

Softmax Layer

Catastrophic Forgetting

Slanted Triangular Learning Rates
- Model should adapt parameters quickly to task specific features
- First, linearly increase the LR and then linearly decay it

Universal Language Model Fine-tuning for Text Classification
Jeremy Howard, Sebastian Ruder
Embedding: Vector Representation of
cancel my flight
ULMFiT: Fine-tuned Intent Classifier

FullCancellation

PartialCancellation
ULMFiT: Fine-tuned Intent Classifier

Gradual Unfreezing
- Gradually unfreeze starting from the last layer as this contains information most specific to a domain
- Unfreeze the next lower layer. Repeat and fine tune all layers
ULMFiT: Fine-tuned Intent Classifier

- FullCancellation
- PartialCancellation
Dealing with Intent Ambiguity
Analyzing Chats

Frame 1
Slot 1  Slot 2  Slot 3

Frame 2
Slot 1  Slot 2  Slot 3

Frame 3
Slot 1  Slot 2  Slot 3

Aggregate frame statistics
Analyzing Chats

CancellationPolicy

FullCancellation

RefundStatus

Aggregate frame statistics
Analyzing Chats

- Prob \((frame_j \mid frame_i)\)
- Chat abandonment analysis
- Agent transfer analysis
  - Last frame before transfer
- Frame level analyses
  - Input methods
    - Touch
    - Type
    - Speak
  - Error analysis
Interactions

User
- Touch
- Type
- Speak
  - Speech To Text

Myra App
- Request (text input)

Dialog Manager
- Get Intent
  - Invoke Action

Intent Classifier

APIs

Analyze & Improve KPIs
Issue Types: Fat head, Chunky middle and Long tail

- Fat head
- Chunky middle
- Long tail

- Late check-in request
- Cancel due to medical emergency
- Require travel insurance certificate
- Train delayed by more than 3 hours
- Claim travel insurance
- Refund discrepancy
- Extra charges at hotel
- Buy insurance

- Meal Included?
- Terminal details

- Cancel my booking
- Resend confirmation

20-30% of issue volume
Rate today’s session

Migrating millions of users from voice- and email-based customer support to a chatbot

Madhu Gopinathan (MakeMyTrip), Sanjay Mohan (MakeMyTrip)
3:45pm-4:25pm Thursday, September 26, 2019
Location: 1E 12/13
Case studies: Strata Business Summit
Secondary topics: Text and Language processing and analysis, Transportation and Logistics

Session page on conference website

O’Reilly Events App
Thank You

Sanjay Mohan & Madhu Gopinathan
www.makemytrip.com