MailBot

Using a Deep Learning Bot Model to Answer Customers Emails Automatically. BANQUE

NATIONALE

Eric Charton Ph.D. Eric.charton@bnc.ca



Digital channels are costly:

- Phone calls
- Emails

- Phone call costs between 10\$ to 30\$
 - Email answering without assistance costs between 10\$ to 15\$
 - Email answering with a recommendation engine costs between 5\$ to 8\$

Any solution to automate information access reduce operationnal costs

2 categories of exchanges :

Informational :

- How to open an account
- How to activate my credit card

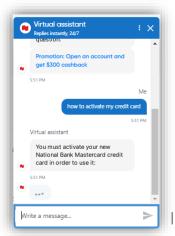
<u>Transactional</u>

- I don't understand this transaction
- Please make a money tranfert

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Existing solutions to automate exchanges

- Information retrieval (search)
- Recommandation engine
- Dialog engines (bots)
- Question answering
- **Classification**





E Factures

comment changer mon mot de passe dans ma banque en ligne;

Où se trouve le bilan de mes comptes?

Produits et services

? Aide et contact

English

Parcourir nos démos

Découvrez étape par étape comment fonctionne votre compte.

- · Faire un tour d'horizon de votre banque en ligne
- Faire un Virement Interac
- Annuler un Virement Interac^{™D}
- · Payer/ajouter une facture
- Ajouter un avis de voyage
- · Mettre à jour mes informations personnelles

Voir toutes les démos

Nous joindre

Service à la clientèle Lundi au vendredi, 7 h à 22 h (HE) Samedi et dimanche : 8 h à 20 h (HE) Sans frais : 1 888 835-6281 Région de Montréal : 514 394-5555

Soutien technique

Besoin d'aide? Appelez-nous, nous pouvons vous aider. Lundi au vendredi: 8 h à 21 h (HE) Samedi et dimanche : 9 h à 18 h (HE) Sans frais : 1 888 835-6281, option 2 et 1

Une question?

Écrivez-nous en indiquant les détails de votre demande, nous vous répondrons dans les plus brefs délais.

Envoyer un message

Succursales

Avant de vous déplacer, consultez notre localisateur pour voir si votre succursale est ouverte ou si les heures d'ouverture ont changé.

Giving message possibilities is a last resort option with modern digital channels ... but you still need it

 \cap

venir

carte de crédit

🐣 Eric

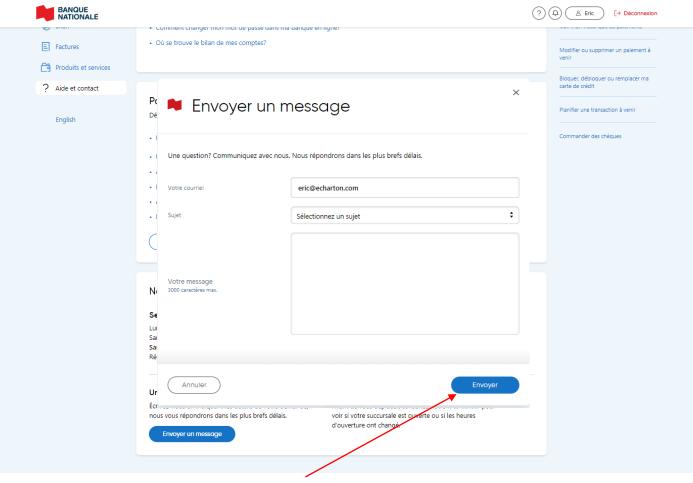
Modifier ou supprimer un paiement à

Bloquer, débloquer ou remplacer ma

Planifier une transaction à venir

Commander des chèques

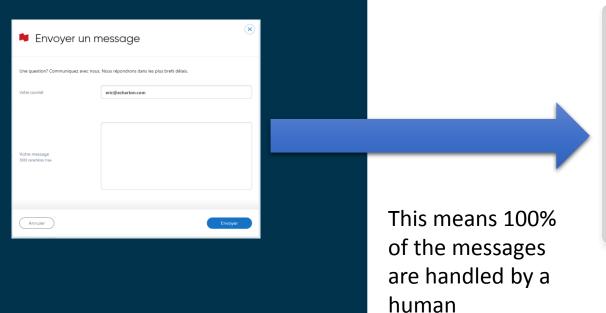
「→ Déconnexion

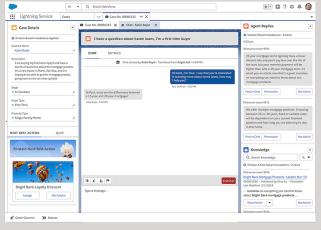


When user send the message, it can go to a person using a recommendation engine

Existing Flow

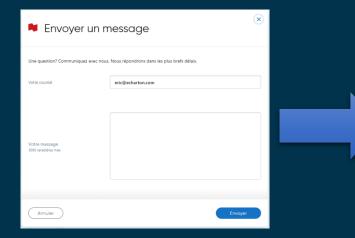






Proposition





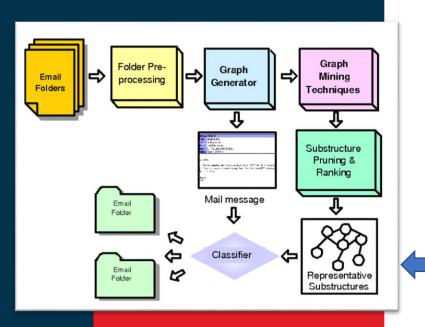


Using a model to automatically try to answer to this message can reduce the amount of need to manually processing mails

	✓ ■ Case No. 00004315 ✓ X	
🗋 Case Details 💌	Cose No.00004315 X Cose No.00004315 Cose No.000445 Cose No.00045 Cose No.000445 Cose No.000445 Cose No.00045 Cose No.00045	Agent Replies
C Einstein Recommendations Applied	I have a question about home loans, I'm a first time buyer	Einstein Recommendations - 3 items
Contact Name		5.02 pm
Katie Boyle 🖌	CHAT DETAILS	Relevance score 96%
Description		25 year mortgage terms typically have a lower interest rate and you'll pay less over the life of
I am buying my first home (yayt) and have a bunch of questions about the mortaaze process.	Chat started by Katle Bayle • Transferred from Bright Bat • 4:59 PM	the loan, but your monthly payment will be
It's a new house in Plano, 3br/3ba, and I'm	Hi Katle, Tm Paul. I see that you're interest	higher than with a 30 year mortgage term. I'll email you an article now that's a great overvie
hoping to be able to get the mortgage process going soon so we can close quickly!	in learning more about home loans, how m 1 hele you?	on everything you need to know about our
State	Paul Hufman - 5 02 PM	mortgage products.
In Contract	Hi Paul, what are the differences between	Post in Chat Personalize Not U
Daver Type	a 15 year and 30 year mortgage?	
First Time	Xade Boyle - 502/9M	Relevance score 92%
PropertyType		We offer multiple mortgage products. Choosis between 15 vs. 30 years, fixed or variable rate
Single Family Home		will be dependent on your current financial
		position and how long you are planning to sta
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The problem :

- 80% of informational questions
- 20% of transactional questions
- Front tail easy to process
- Long tail difficult to modelize



Machine learning classification models:

- Are able to classify document
 - But make errors (precision)
- Can provide a pre-defined class/answer

They are not :

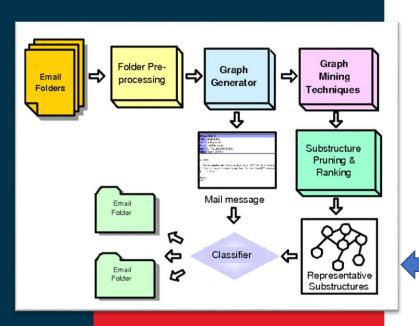
- Capable to process transactions
- Not always good to handle multiple small classes
- Have difficulties to separate in the long tail

How to ensure that the customer receive a correct answer ?

Good example of something that is not working ...

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How to ensure that the customer receive a correct answer ?

- Work on model
- Work on UI

Good example of something that is not working ...

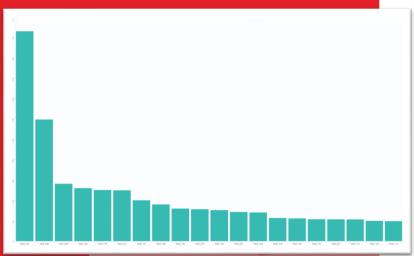


The ML aspect

A lot of classes ...

Why many previous attempts of classification for mail answering are not satisfying ?

- The distribution of the questions is mostly a long tail
- Some questions have a few training samples
- The classes are mostly unbalanced
- Each answer is a class (100' of classes)
- Many questions with high frequency are transactional



Real operationalization of ML for email

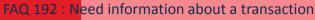
answering is a very difficult task

- Low F-Score
- Bad Precision or low recall
- How to remove what we do not want to classify and handle it ?
- How to preprocess long emails ?

In fact, a bot model is very good at all of it :

- RASA Deep learning intents classifications models are good with small classes
 - hundreds of intents (around 500 in our main bot)
- A lot of intent with a very small amount of training samples
- Returning a probability for each intent
 - It is possible to remove transactional questions from the training corpora

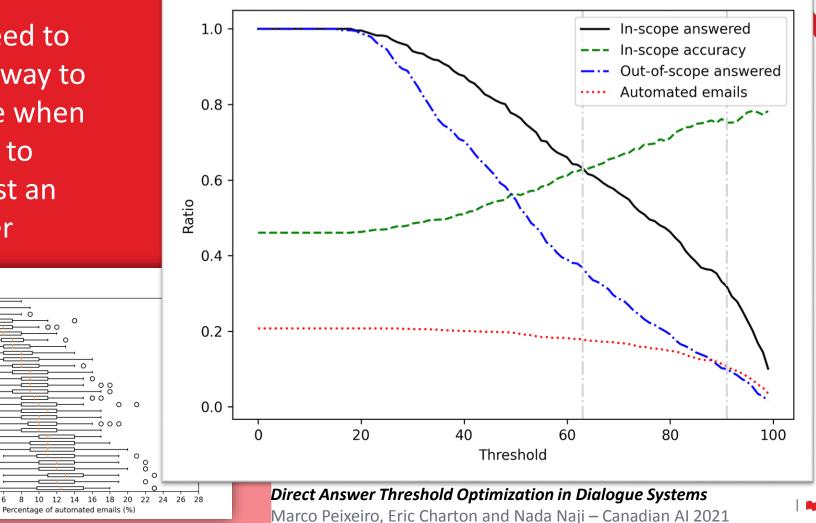
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We need to find a way to decide when or not to suggest an answer

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10 12 14



The model profile

We use as test corpus made of real customers emails

- 150 questions answered by the bots are asked in customers mails
- We re-use bot models for training

Some facts:

- Coverage : how many mail questions asked we have an answer in the bot model
 - 40.3%
- Mean length of messages
 - 148 characters
- How many answers from the bot we will use (after rejecting transactional and others) ?
 - 47 (on 300)

Prototype performances:

When the mail classifier should not answer :

90% correct identifications (low probability)

When the mail classifier should give an answer:

In 50% of cases the classifiers give an answer

When the mail classifier gives an answer

The answer is good in 60% of cases

The prototype was able with correct threshold to reduce the mail flow to agents by 11%



The UI aspect

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\$ Payer	Aide	et contact			
Throwar Envoyer	Ques	stions populaires			Actions rapides
Transférer	• Pour • Pour	🗯 Envoyer un m	nessage	ligne?	Voir mes relevés Minscrire au dépôt direct de l'Agence de revenu du Canada
🕄 Bilan	• Com • Com • Où s	Une question? Communiquez avec nous.	Nous répondrons dans les plus brefs délais.		Voir mon historique de paiements
Factures Factures Produits et services		Votre courriel	eric@echarton.com		Modifier ou supprimer un paiement à venir Bloquer, débloquer ou remplacer ma
? Aide et contact		Votre message	Comment déposer un chèque avec mon téléphone ?		carte de crédit Planifier une transaction à venir
		3000 caractères max.			Commander des chèques
		Annuler	Envoyer		Bonjour, je suis l'assistant virtuel de la Banque Nationale. •

User ask a question



T Envoyer	Questions populaires	Actions rapides
C Transférer	 Pour Pour Pour Com 	Voir mes relevés M'inscrire au dépôt direct de l'Agence de revenu du Canada
 Bilan Factures Produits et services 	Com Une question? Communiquez avec nous. Nous répondrons dans les plus brefs délais. Où s Votre courriel eric@echarton.com	Voir mon historique de paiements Modifier ou supprimer un paiement à venir
? Aide et contact	Votre question : Comment déposer un chèque avec mon téléphone ?	Bloquer, débloquer ou remplacer ma carte de crédit
English	L'option de dépôt numérique de chèques est disponible uniquement sur notre application mobile Banque Nationale. Vous pouvez la télécharger à partir de votre appareil mobile Apple ou Android. <u>Visitez notre site</u> pour plus d'informations. Une fois connecté à votre application mobile Banque Nationale, cliquez sur Déposer en bas de l'écran de votre appareil mobile.	Planifier une transaction à venir Commander des chèques
	Êtes vous satisfait de la réponse ? Oui Non	Bonjour, je suis l'assistant virtue de la Banque Nationale.

A classification model gives an answer. The UI ask user validation : are you ok with the answer ?



7 Envoyer	Question	s populaires		Actions rapides
Transférer		Envoyer un message	(×) ligne?	Voir mes relevés Minscrire au dépôt direct de l'Age de revenu du Canada
 Bilan Factures Produits et services 	• Com • Com • Où s			Voir mon historique de paiement Modifier ou supprimer un paieme venir
? Aide et contact		Merci et bonne journée !		Bloquer, débloquer ou remplacer carte de crédit Planifier une transaction à venir
				Commander des chèques

If the answer is accepted, the mail answering is fully automated



Transférer Accueil Bilan Factures Produits et services	Questions populaires Pour Pour Pour Com Com Une question? Communiquez avec nous. Nous re Où s Votre courriel	sage	× ligne?	Voir mes relevés M'inscrire au dépôt direct de l'Agence de revenu du Canada Voir mon historique de paiements Modifier ou supprimer un paiement à venir
Accueil Bilan Factures Produits et services	Pour Com Com Une question? Communiquez avec nous. Nous re Où s	SAGE	× ligne?	M'inscrire au dépôt direct de l'Agenc de revenu du Canada Voir mon historique de paiements Modifier ou supprimer un paiement a
Accueil Bilan Factures Produits et services	Pour Com Com Une question? Communiquez avec nous. Nous re Où s	èpondrons dans les plus brefs délais.	ingine:	de revenu du Canada Voir mon historique de paiements Modifier ou supprimer un paiement
 Accueil Bilan Factures Produits et services 	Com Com Une question? Communiquez avec nous. Nous r Où s			Voir mon historique de paiements Modifier ou supprimer un paiement
Factures	Com Une question? Communiquez avec nous. Nous r Où s			Modifier ou supprimer un paiement
Produits et services		vecharton.com		
2 Aide at contact				
Alde et contact	Votre question : Comment déposer un cl	nèque avec mon téléphone ?		Bloquer, débloquer ou remplacer ma carte de crédit
	Un agent va répondre rapio	lement à votre question		Planifier une transaction à venir
English				
				Commander des chèques
	Nous joindre			
	Service à la clientèle	Soutien technique		
	Lundi au vendredi, 7 h à 22 h (HE) Samedi et dimanche : 8 h à 20 h (HE)	Besoin d'aide? Appelez-nous, nous pouvons vous aider. Lundi au vendredi : 8 h à 21 h (HE)		

Is the answer is not accepted, the normal process (flow using recommendation engine) is activated.

Advantages



• Definitive solution

- Re-use existing bot models
- Do not involve re-design of the existing systems

• Easy to integrate in existing flow

- Just need to get the mail content
- Do not modify the behavior of existing tools
 - Salesforce Einstein, Remedy ...

• Low cost

- The same model is used for bots and mail answering
- Do not need specific ML system design
- Re-use existing dialog assets from the organisations
- Client centric
 - Automatic answering in 13% to 17% of cases
 - Reduction of mail manual handling by 12% to 15%
 - Customers answers can be used to improve models

Thank you !

