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AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

Using Machine Learning to Lower Student Contact and Support Centre Call Time

Niko Uusitalo



What makes up the incoming queries?

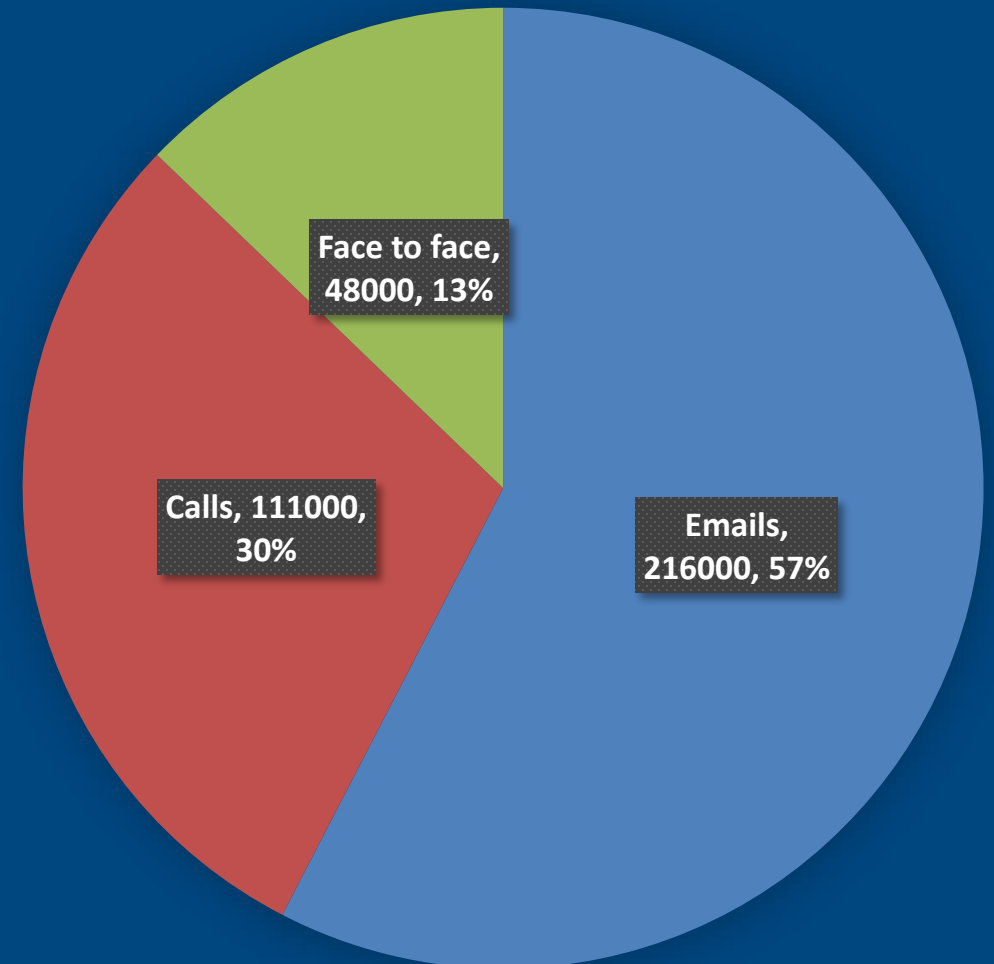
Query topics can include

- Accommodation
- Admission
- Contacting specific staff
- Course advice
- Enrolment
- Examinations
- Fees
- Graduation
- Transcript
- Password reset
- Exams office
- Scholarships
- Numerous redirects to other departments or faculties



How many incoming queries?

- For 2016
 - Emails: 216k
 - Calls: 110k
 - Face to face: 48k
 - Total queries: 375k
- Queries depend on the time of year
 - Accommodation at the start of the year
 - Enrolments at the start of semester
 - Examinations at the end of semester
 - Graduation in Spring and Autumn





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How we're going to help

- Help train up new people by allowing them to explore and query the knowledge base using their own and caller's words
- Lift the easy emails with a bot so we can have our experienced student advisors involved with the more complex queries.



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Enabling faster training

- Our primary goal is aiding student advisor training
 - Takes six weeks to fully train a new member
 - Often are students, with schedules to work around their studies
 - Annual churn as students leave the University having completed their studies
- Unfamiliar with specific wording or translating what calls are really about
 - We can use machine learning to fill in the gap to speed up training



Hi! I'm UoA Student Help. Say "hi" if you'd like to chat.

UoA Student Help · 1 min ago

hi

You · 1 min ago



Welcome to the University of Auckland Student Service Centre. Type a question to get started.

UoA Student Help · 1 min ago


[Download chat logs](#) | [Upload chat logs](#)

Type your message...



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- We've trained the bot to understand
 - that "Canvas" and "LMS" are the same
 - that "access" and "log in" are the same
- The bot doesn't care about punctuation
- Other variations in asking questions are understood by a pre-trained model
- Obvious typos are understood (not shown)

Learn from how your users are using the service, with Active Learning. [Learn more](#) 

From FAQ to Bot in minutes.

Build, train and publish a simple question and answer bot based on FAQ URLs, structured documents or editorial content in minutes.

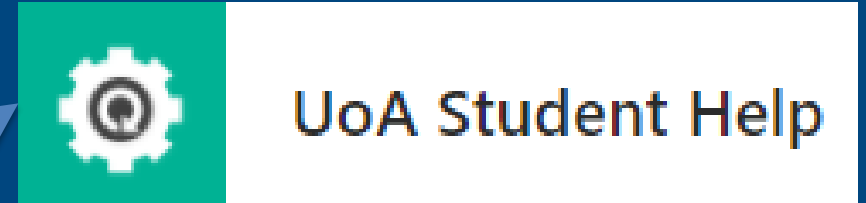
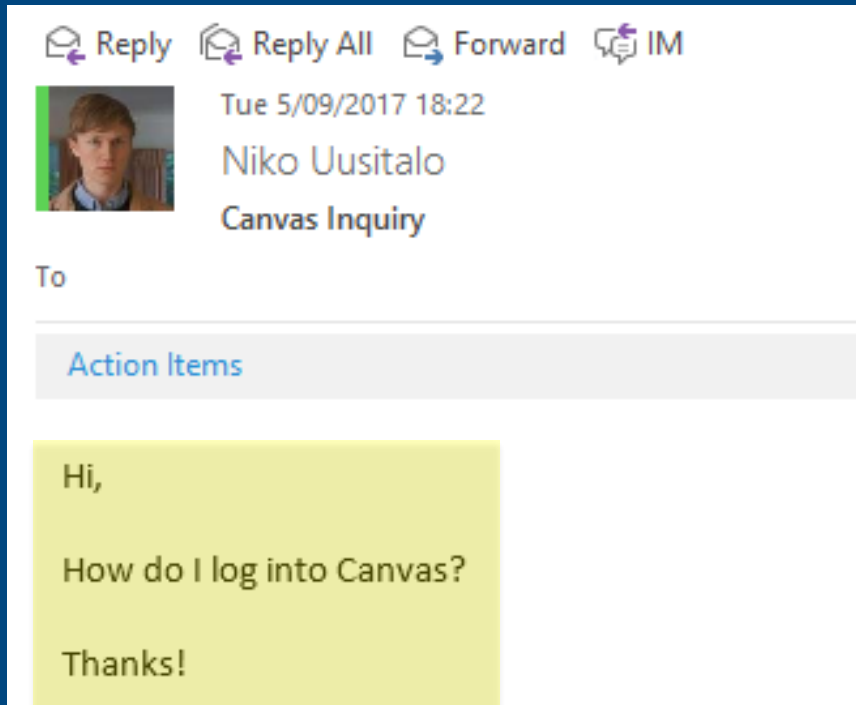
GET STARTED 





Skimming over emails

- We'll also look at intercepting email that come through, running them through the bot backend and if there's a high confidence in answering, we can send an automatic reply with the answer and a link to the knowledge base article, otherwise a student advisor will follow up
- We then have a couple of options
 - Have a link for the student to click if the answer is incorrect. This keeps them in the service queue
 - Have a link for the student to click if the answer is correct. This stops the email from being seen by a student advisor
 - Follow up regardless if the bot had a high confidence in the answer



Parse email for question

How do I log into Canvas?

Email back

To log into Canvas, please go to [Canvas](#)
Enter your University username (e.g jblo007) and password and click on login.

[APIs Documentation](#) > [API Reference](#)[POST](#) [Create Knowledge Base](#)[DELETE](#) [Delete Knowledge Base](#)[GET](#) [Download Alterations](#)[GET](#) [Download Knowledge Base](#)[POST](#) [Generate answer](#)[PUT](#) [Publish Knowledge Base](#)[PATCH](#) [Train Knowledge Base](#)[PATCH](#) [Update Alterations](#)[PATCH](#) [Update Knowledge Base](#)

QnAMaker - V2.0

[↓ API definition](#)

Generate answer

Returns the list of answers for the given question sorted in descending order of ranking score.

[Open API testing console](#)

Request URL

<https://westus.api.cognitive.microsoft.com/qnamaker/v2.0/knowledgebases/{knowledgeBaseID}/generateAnswer>

Request parameters

knowledgeBaseID	string	knowledgeBasedID, this should be get from QnAMaker portal
------------------------	--------	---

Request headers

Content-Type (optional)	string	Media type of the body sent to the API.
--------------------------------	--------	---



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Looking at machine learning

- We make extensive use of Microsoft's QnAMaker
 - Designed specifically for question and answer scenarios with intelligence baked in
- LUIS
 - Language Understanding Intelligent Service
 - The natural language interpreter
 - Understands typos, punctuation mistakes, alternative wordings



Type a command to control the lights:

For example: turn on the lights

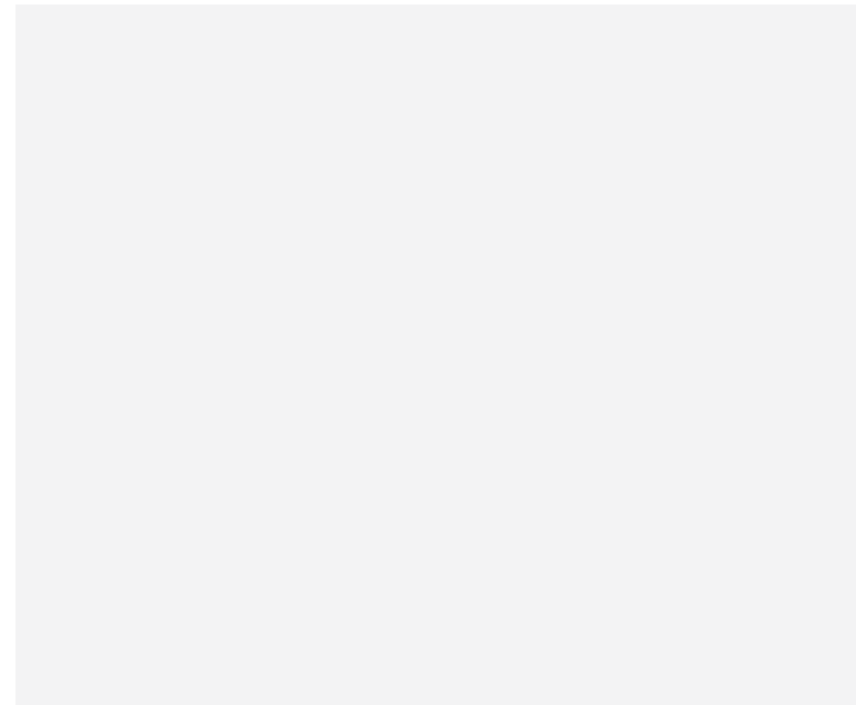
Submit

Please, enter text.

Smart light application in action [i](#)



LUIS application response [i](#)





Technology involved

- All cloud, based in Microsoft Azure, took less than a day to running
 - QnAMaker
 - Machine learning component
 - Table storage
 - Stores parsed data to put into QnAMaker
 - Website hosting
 - Provides a place for the interface
 - Bot Connector (Part of the Bot Framework)
 - Allows for flexibility to interface to Skype, Facebook, etc
- Most of the time spent is for training the model for machine learning
 - Gathering requirements
 - Getting data
 - Sanitising data

Tech Help Bot

Entertainment Bot

Health Bot

Recipe Bot

...

Chat Channels

Email

FB

Skype

Slack

Web

...

Bot Platforms

Microsoft Bot Framework

Other Bot Platforms

Knowledge base endpoint

Indexing & Ranking

Extract QnA

QnA Maker

FAQ content



txt



url



pdf



doc



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```
public async Task<HttpResponseMessage> Post([FromBody]Activity activity)
{
    if (activity.Type == ActivityTypes.Message)
    {
        await Conversation.SendAsync(activity, () => new Dialogs.QnADialog());
    }
    else
    {
        HandleSystemMessage(activity);
    }
    var response = Request.CreateResponse(HttpStatusCode.OK);
    return response;
}
```



QnAMakerDialog by Gary Pretty

v1.1.1

QnAMakerDialog for the Microsoft Bot Framework is a dialog that allows you to easily integrate the QnA Maker Service, part of Microsoft Cognitive Services to you...

<https://github.com/garypretty/botframework>

```
[Serializable]
[QnAMakerService("", "")]
1 reference
public class QnADialog : QnAMakerDialog<object>
{
    0 references
    public override async Task NoMatchHandler(IDialogContext context, string originalQueryText)
    {
        await context.PostAsync($"Sorry, I couldn't find an answer for '{originalQueryText}'.");
        context.Wait(MessageReceived);
    }

    [QnAMakerResponseHandler(50)]
    0 references
    public async Task LowScoreHandler(IDialogContext context, string originalQueryText, QnAMakerResult result)
    {
        await context.PostAsync($"I found an answer that might help...{result.Answer}.");
        context.Wait(MessageReceived);
    }
}
```



A glance at the data

How much does it cost to stay in University accommodation? → Accommodation fees vary depending on the style of residence, room type, and whether there are meals included. All residences have power, water, and internet included in the fees. To find out more about 2018 fees for all University accommodation, see [Accommodation Fees] (<http://www.accommodation.auckland.ac.nz/en/what-will-it-cost-you.html>). → qnadata.tsv

How do I log into Canvas? → To log into Canvas, please go to [Canvas] (canvas.auckland.ac.nz). Enter your University username (e.g. jblo007) and password and click on login. → qnadata.tsv

Why do I have to supply certified hard copies of my birth certificate, passport and/or residence evidence? → In order for us to verify your legal name, date of birth and citizenship status please send in certified hard copies of your identification documents such as a certified hard copy of your birth certificate or relevant pages of your passport. \n \n \n \n Unfortunately your identification documents cannot be uploaded to your application. → qnadata.tsv

Do international applicants need to pay an application fee when applying for admission to the University of Auckland? → No, international applicants do not pay an application fee when applying for admission. This type of fee is only applicable to applicants who are considered domestic. → qnadata.tsv

What is the UMAT cut-off score? → There is no set cut-off point for UMAT used for selection to The University of Auckland medical programme. We encourage you to do as well as you can, but ultimately you will be ranked against all other candidates in our calculation of the final rank score using your overall raw score for the test → qnadata.tsv

What are the application fees? → Application fees are charged depending on the nature of the application and only apply to domestic applicants. \n \n \n \n An application fee is non-refundable and only charged once, regardless of the number of applications (and the outcome of your applications) for the same applied semester. The fees could be charged a second time for applications to subsequent semesters, or if a new assessment is required. → qnadata.tsv



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Logging into Canvas

How do I log into Canvas?

To log into Canvas, please go to canvas.auckland.ac.nz.

Enter your University username (e.g jbloo07) and password and click on login.



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Where are we up to?

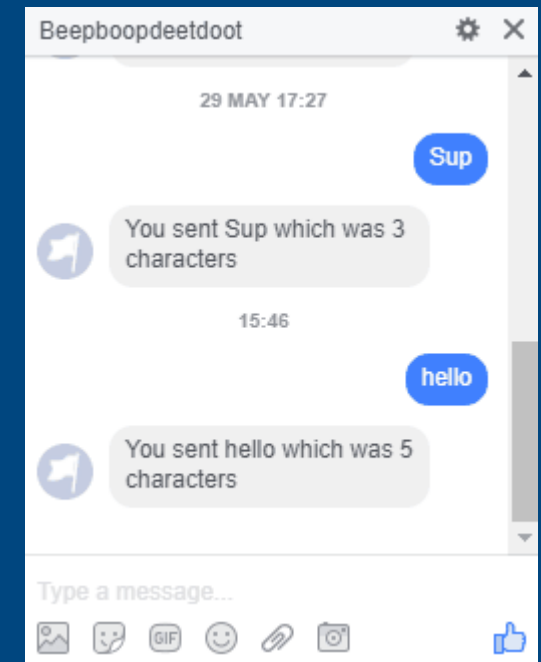
- Sent away first prototype to be used
- Feedback included
 - Delay in getting result
 - Results weren't accurate
 - The bot didn't understand questions outside of what it was trained on
- Problems easily fixed
- Move on to a second prototype



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Where to in the future?

- Further prototype refining
- Expand to staff service centre
- Allow students to query the bot themselves
- Move away from QnAmaker to do our own architecture
- Look at different languages





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Thank you

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