LUIS integration with Bot framework

Vinnie Saini
Cloud Solution Architect
Big Data & AI
vasaini@Microsoft.com
The problem

Language understanding in human-computer interaction is:

Technically challenging
It’s exceedingly difficult to enable a computer to understand what a person wants and to find the pieces of information that are relevant to their intent.

Costly to implement
Building and maintaining machine learning systems requires a large investment of time, money and engineering resources.

Often domain specific
In the past, building your own machine learned models often required assistance of a team of data scientists that would customize the models to the specific domain.
Introducing Language Understanding Intelligence Service (LUIS)

A Microsoft Cognitive Service that provides developers with an easy way to create language models to allow applications to understand user commands.

- Create your own LU model
- Train by providing examples
- Deploy to an HTTP endpoint and activate on any device
- Maintain model with ease
LUIS offers integration with Microsoft Bot Framework and Slack, which enables developers to build and connect intelligent bots to interact with users no matter which device they are on or which technology they are using.

LUIS has been used to build a wide range of IoT applications ranging from a simple voice activated lights control to smart kitchen appliances, smart vending machines, facial recognition door, and many more.

LUIS uses pre-built models from Bing and Cortana which enable developers to easily add personal assistant functionalities to their apps.
LUIS Benefits

**Easy:**
Use simple UX editor to create language understanding models

Create models for your application to better understand intents like “turn on the lights”, or entities such as “start a new jog/walk/hike/bikeride”. Tune your model with in-depth performance visualizations.

**Fast:**
Add conversational intelligence to your apps in minutes

LUIS has a powerful dialog engine that enables you to maintain context, author and execute any dialog in just a few steps.

**Flexible:**
Activate models on any device

Activate your language understanding models from your application on your phone, tablet, or any other device that has access to the Internet.

**Expert:**
Leverages MSR technology

LUIS leverages innovative AI technology from Microsoft Research.
LUIS is designed to enable you to quickly deploy an HTTP endpoint that will take the sentences you send it and interpret them in terms of the intention they convey and the key entities that are present.

After your endpoint has processed a few dozen interactions, LUIS begins active learning. LUIS examines all the utterances that have been sent to it, and calls to your attention the ones that it would like you to label.

LUIS relies on the cutting-edge technologies developed and incubated directly by Microsoft Research that have been tried and tested with hundreds of internal and external customers all over the globe.

In addition to allowing you to build your own applications, LUIS also provides selected models from the Microsoft Cortana personal assistant as a pre-built application.
Key features

Easy creation of LU models
LUIS offers a set of user-friendly tools that completely abstract technical complexity and get you up and running with just a few steps.

Active learning
This breakthrough feature enables LUIS to examine all the utterances that have been sent to it, critique its own work, and ask for any corrections in order to continually improve accuracy.

Action fulfillment
LUIS is able to fulfill actions that were triggered through a set of channels (HTTP, news, stocks, etc.).

Dialog support
LUIS provides a way to add a prompt question if user query is missing any of the required parameters.
How LUIS works

1. Create a New App

Go to luis.ai:

Sign in with your Microsoft account (MSA). If you don’t have MSA, you will have an option to create one.

Get started by creating a New App and entering some basic information.

Next, you will be presented with the Application Editor Workspace that will allow you to create and train your own language understanding model.
How LUIS works

Add intents and entities

Intents:

Intents are actions that a user wants your app to take or the information they would like to obtain.

Example intents could include getting weather, booking tickets, adding a calendar entry or operating a light fixture.

Add one or more of user intents that you expect your app to handle by clicking + next to Intents item in the left-hand panel of the Editor Workspace.
How LUIS works

Add intents and entities

Entities:

Entities are real world objects such as persons, locations, organizations, products, etc. that can be denoted with a proper name. Entities can be abstract or have a physical existence.

Entities can be generic (location, celebrity, datetime) or more specific (Seattle, Satya Nadella, June)

Add one or more entities that you expect your app to recognize by clicking + next to Entities item in the left-hand panel of the Editor Workspace.

Several commonly used pre-built entities (e.g. datetime, number) are also available to be added to the app by clicking + next to Pre-built Entities.
How LUIS works

3 Provide more labeled examples

Seed the system with more examples of utterances:

Enter more examples of queries that you expect your users to make.

As you enter each one, you will need to:

• select the name of the correct intent from the dropdown
• label your entities that appear in each utterance by clicking on the entity and choosing corresponding label from the list
• pre-built entities get automatically labeled in grey

The more examples you provide, the more accurate the predictions.
How LUIS works

As you click Train at left bottom corner of the page, LUIS:

Generalizes from the examples you provided.
Uses logistic regression classifiers to recognize intents.
Uses conditional random field to determine the entities.
How LUIS works

5  Publish your model

Deploy the model to an HTTP endpoint:

Click the Publish button in the upper left-hand corner.

The URL that you see appear after a few moments makes your model available as a web service.
How LUIS works

Activate model from your application on any device:

Update the URL with the parameter for the user query.

The response received from LUIS will contain the list of detected intents and entities together with the confidence scores.

You can now use this information in your app. For our example, we could next call the weather service and display the response in our app UI:

What's the weather in Berlin

The weather is sunny with a temperature of 88°F. (Data provided by Foreca: http://www.foreca.com)
Advanced features
How LUIS works

Action binding

Define actions:

You may (optionally) link your intents to actions and specify requirements for the action to be triggered.

LUIS supports only one action per intent. Each action can include a group of parameters derived from entities.

Add actions, but by clicking + Add Action in the ‘Add a new intent’ dialog, entering action parameters and specifying which if any of these are required.
How LUIS works

Action fulfillment

Actions:

Once actions are defined, LUIS enables to fulfill those that were triggered through a set of channels. For example, if you created the “GetWeather” intent and the action has been triggered (all the required parameters were filled), you can use the GetCurrentWeather channel to retrieve the weather for your users to see.

To use this feature, select Go to Preview in the LUIS Application Editor top ribbon. Then, select the intent that is linked to the action you want to fulfill and fill out Action Info sub-section to enable action types.

In the Action Settings sub-section, map the action to a parameter from the Append a Parameter drop-down list, in this case “location”.

[Image description: The LUIS editor interface is shown with a highlighted section for adding a new intent. The screen displays a form for creating an intent named “GetWeather.” The form includes options to add action info and parameters, with a selected parameter labeled “MyLocation.”]
How LUIS works

Action fulfillment

JSON Response:

Here is an example of the JSON response that is returned when an action is fulfilled.

Notice that the “MyLocation” required parameter is set to TRUE, which means this parameter was filled in. Thus, the action will be triggered as all of its required parameters are available.
Use LUIS to create and connect intelligent bots with users

Bot Framework Integration

Create a new bot in the MS Bot Framework:

After you Publish your model via LUIS Application Editor Workspace and get the dialog box that contains the URL, select “Enable Action binding using Microsoft Bot Framework”.

The link in the field brings you to the webpage where you can create your bot. You can register a new bot right there.
Use LUIS to create and connect intelligent bots with users

Configure LUIS to enable calling one service to the other:

Once the new bot is created, copy the App ID from the Microsoft Bot Framework to your LUIS application.

Copy the App secret into the correct field in the LUIS publish dialog box as well.

Finally, copy over the redirect URL provided by LUIS to your app on Microsoft Bot Framework. Note: same URL as in the registration step.

When this configuration is done and the application is correctly created within the Bot Framework, there are additional steps required to enable various channels depending on your preferences. Follow the instructions on Microsoft Bot Framework to enable SMS, Slack, etc.
## LUIS

### Improve model performance

<table>
<thead>
<tr>
<th>Why it helps</th>
<th>When to use</th>
<th>Add model features</th>
<th>Add more labeled utterances</th>
<th>Fix incorrect utterance labels</th>
<th>Change the schema</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Providing explicit knowledge about the entities by creating a list that features them helps LUIS with sentence analysis. Add features with some or all of an entity’s values via Phrase List Features</strong></td>
<td><strong>The model fails to see that a class of words or phrases is similar (e.g. names of cities).or is having trouble identifying an entity</strong></td>
<td><strong>Ultimately, performance of ML models depends on quality and quantity of the labels. The more labels, the greater the performance</strong></td>
<td><strong>A common cause of error can be traced to a label that has been mis-assigned</strong></td>
<td><strong>In some cases, the schema and the definitions of the intents and entities are too hard for a ML algorithm to learn</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Add features with some or all of an entity’s values via Phrase List Features</strong></td>
<td><strong>The model fails to act on rare or proprietary words</strong></td>
<td><strong>The model fails to differentiate between two different intents</strong></td>
<td><strong>The model fails to differentiate between two different intents, even though similar utterances have been labeled</strong></td>
<td><strong>You have difficulty deciding how to label utterances, and the model is performing poorly, despite having tried all the other options described here</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Add features with some or all of an entity’s values via Phrase List Features</strong></td>
<td><strong>The model fails to recognize an entity based on words that surround it</strong></td>
<td><strong>The model fails to recognize an entity based on words that surround it</strong></td>
<td><strong>An entity is consistently being missed, even though similar utterances have been labeled</strong></td>
<td><strong>Changing the schema might mean combining, re-grouping, or dropping intents or entities</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Add features with some or all of an entity’s values via Phrase List Features</strong></td>
<td><strong>The model erroneously and systematically assigns low scores to one intent</strong></td>
<td><strong>The model erroneously and systematically assigns low scores to one intent</strong></td>
<td><strong>The model erroneously and systematically assigns low scores to one intent</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ultimately, performance of ML models depends on quality and quantity of the labels. The more labels, the greater the performance.
## LUIS Pricing

### Free Plan
- Free for up to 10K transactions per month
- Limited to 5 TPS

Once the monthly quota is reached, the API will start returning an error code.
If the quota is reached or if higher throughput rate is desired, the customer needs to upgrade from the free tier to the paid plan.

### Standard Plan
- $0.75 per 1K transactions* as you scale up
- No monthly quota limits
- Limited to 10 TPS

*Current rate is discounted until GA

For unlimited traffic to your HTTP endpoint, you must create a metered key for your account by signing into Microsoft Azure Portal and following the steps outlined here.
## LUIS Top FAQs

<table>
<thead>
<tr>
<th>What languages does LUIS support?</th>
<th>Can LUIS be accessed programmatically?</th>
<th>How do I get subscription keys for LUIS?</th>
<th>Does LUIS allow app sharing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The LUIS UI is always in English, but several languages such as English, French, Italian, Spanish, Chinese, German, Japanese and Portuguese are supported when it comes to understanding utterances.</td>
<td>LUIS offers a programmatic REST API that can be used to automate the application creation process. This API allows you to author and publish your application by using LUIS endpoints.</td>
<td>Visit <a href="https://www.microsoft.com/cognitive-services/en-us/luis-api/documentation/azureibizasubscription">https://www.microsoft.com/cognitive-services/en-us/luis-api/documentation/azureibizasubscription</a> for detailed information about the subscription process.</td>
<td>LUIS provides a way to export all of the labels and features entered for an application to a JSON file that can be shared with other LUIS developers or re-imported into a different application.</td>
</tr>
</tbody>
</table>
Next steps

- To learn more about LUIS and Microsoft Cognitive Services:
  - [www.microsoft.com/cognitive](http://www.microsoft.com/cognitive)
- To try and evaluate LUIS for free, please visit:
  - [www.luis.ai](http://www.luis.ai)
Support Forum? stackoverflow tag: microsoft-cognitive

UserVoice: https://cognitive.uservoice.com/