

Food Nutrition Skill Using Alexa

Sonal M. Nandurkar, Pravini S. Deotale, Vrushali T. Pimpalshende , Arti M. Deshmukh, Asma M. Khan, Prof. Anand D.G. Donald

Rajiv Gandhi Collage Of Engineering Research And Technology Chandrapur Computer Technology,
Rajiv Gandhi Collage Of Engineering Research And Technology Computer Technology, Chandrapur, Computer Technology

Abstract: One of the world greatest challenges is to insure sufficient and healthy food for all, and to do so in an environmentally sustainable manner. This review explores the interrelationships of food ,health and environment and their role in addressing chronic micronutrient deficiencies, also known as 'hidden hunger',affecting over two billion people worldwide. While the complexity and underlying determinants of under nutrition have been well-understood for decades, the scaling of food and nutrition system approaches that combine sustainable agriculture aimed at improved diet diversity and livelihoods have been limited in their development and implementation.

In this research paper, we propose voice services using Amazon product, ALEXA and aim to solve one of the most important issues in outpatient healthcare And to get the knowledge about the integredient of the food we eat in order to improve our health and upload if on cloud so any one access it using amazon alexa.

Keywords— voice service APIs; Amazon Alexa; Internet of Things (IoT); Cloud Service; Amazon Web Service(AWS). Health;

I. Introduction

Voice Service enabled technologies are becoming increasingly ubiquitous. The devices that are powered by voice service technologies have seen greater market adoption-“ In November 2014, Amazon announced Alexa alongside the echo Alexa was inspired by the computer voice and conversation system on board the Starship Enterprise in science fiction TV series and movies, beginning with Star Trek The Original Series and Star Trek: The Next Generation.^[9] A year prior to the original Star Trek TV series, in 1964, premiered the original Jonny Quest animated series which had desktop computer called UNIC (pronounced /'ju:nrs/YOO-nisslike the name Eunice).^[10] UNIC communicated in digital readout and voice response.

The name Alexa was chosen due to the fact that it has a hard consonant with the X and therefore could be recognized with higher precision. The name is also claimed to be reminiscent of the Library of Alexandria”

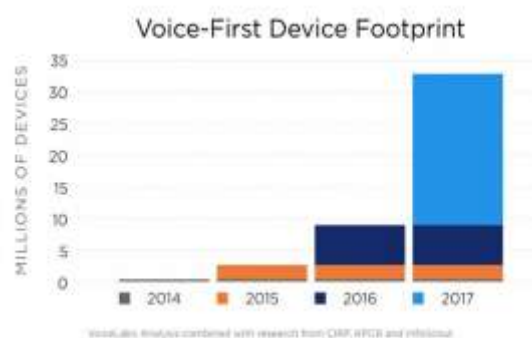


Fig. 1. Voice-First Device Footprint

The data collected from voice service devices would provide immense benefits to the healthcare. The voice services device , importantly, enable collaborative communication in improving Human beings health“voice service enabled device like ALEXA to empower two way form of communication in that it provides useful information to peoples and also collect really curious data about food nutrition that could potentially be used for superior understanding things as they’re happening in various parts of the country.

II. Understanding Analytics And Voice Service

A. Voice Service APIs

The Voice Service (VS) API allows developers to voice enable connected products with a microphone and speaker.

B. Alexa Voice Service APIs (AVS)

Alexa Voice Service (AVS) is Amazon's suite of services built around its voice-controlled AI assistant for the home and other environments. AVS and Alexa were first introduced with Echo, the company's intelligent speaker, which enables voice interaction with various systems in the environment and online. Alexa is available for an ever-increasing number of other devices, including smart phones, tablets and remote controls. AVS is tightly integrated with Amazon's e-commerce environment, which means that it makes purchases fast and simple. The system can operate as a home automation hub, allowing the user to control heating and lighting systems, for example. Alexa also connects to streaming media services online, and supports If This Then That (IFTTT), an online service that automates Web-based tasks so that when user-specified events occur, follow-up tasks are triggered and handled.

In the AVS environment, services are known as skills. Hurricane Center, for example, is an Alexa skill that provides constantly updated information on storm systems, based on data from government agencies. A skill called Virtual Librarian is essentially a recommendation engine that suggests books, based on awards nominations, bestseller lists and user reviews. Alexa Skills Kit, a software development kit (SDK), is made freely available to developers and skills are available for instant download from Amazon.com.

C. Alexa Skills Kit

The Alexa Skills Kit is a software development kit (SDK) that enables a developer to build skills, also called conversational applications, on the Amazon Alexa artificial intelligence assistant. The Alexa Skills Kit is comprised of tools, application program interfaces (APIs), code samples and documentation that enables a developer to add skills to the 10,000-plus voice recognition capabilities available on Alexa. Amazon Alexa is based in the Amazon Web Services (AWS) public cloud. A developer can upload Alexa skill code to AWS Lambda functions to execute code that is triggered by voice interactions. AWS automatically manages the compute resources for Lambda. A developer can certify, publish and update skills, which are made available through the Alexa Skills Store. An organization can build an Alexa skill to connect to end users via the conversational Amazon Echo platform. A developer programs the voice user interface to return a variety of voices, accents and responses based on the code for the skill.

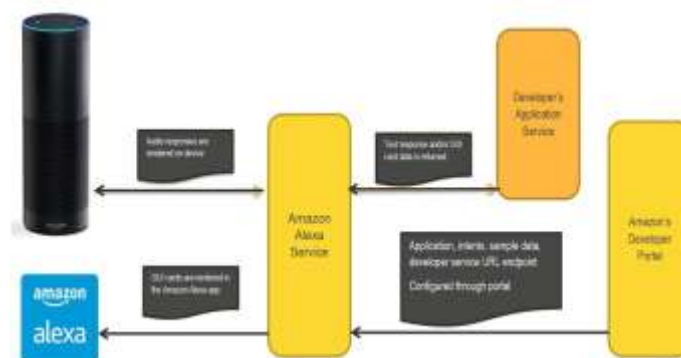


Fig. 3. Alexa Skill Kit Architecture

D. AWS LAMBDA

AWS Lambda	
Developer(s)	Amazon.com
Initial release	November 2014; 4 years ago
Operating system	Cross-platform
Available in	English
Website	aws.amazon.com/lambda

AWS Lambda is an event-driven, serverless computing platform provided by Amazon as a part of the Amazon Web Services. It is a computing service that runs code in response to events and automatically manages the computing resources required by that code. It was introduced in November 2014.^[1]

The purpose of Lambda, as compared to AWS EC2, is to simplify building smaller, on-demand applications that are responsive to events and new information. AWS targets starting a Lambda instance within milliseconds of an event. Node.js, Python, Java, Go^[2], Ruby^[3] and C# through .NET Core are all officially supported as of 2018, and other languages can be supported via call-outs. However, some runtimes, such as the Java virtual machine, may be slower than others to start.

AWS Lambda was designed for use cases such as image or object uploads to Amazon S3, updates to DynamoDB tables, responding to website clicks or reacting to sensor readings from an IoT connected device. AWS Lambda can also be used to automatically provision back-end services triggered by custom HTTP requests, and "spin down" such services when not in use, to save resources. These custom HTTP requests are configured in AWS API Gateway, which can also handle authentication and authorization in conjunction with AWS Cognito.

Unlike Amazon EC2, which is priced by the hour but metered by the second, AWS Lambda is metered in increments of 100 milliseconds. Usage amounts below a documented threshold fall within the AWS Lambda free tier - which does not expire 12 months after account signup, unlike the free tier for some AWS services.^[6]

E. IOT(Internet of Things)

The **Internet of Things (IoT)** is the network of devices such as vehicles, and home appliances that contain electronics, software actuators and connectivity which allows these things to connect, interact and exchange data.

IoT involves extending Internet connectivity beyond standard devices, such as desktops laptops smartphones and tablets to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet and they can be remotely monitored and controlled.

In contrast to IoT the **Intranet of Things (IoT)** (mention the small "i") focuses more on the privacy and a restricted network (e.g. private smart home or company intranets). The connectivity of the devices is mainly in the intranet and only the necessary information is communicated to the outside via IoT.

F. Cloud service

amazon Web Services (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms to individuals, companies and governments, on a paid subscription basis. The technology allows subscribers to have at their disposal a virtual cluster of computers, available all the time, through the Internet. AWS's version of virtual computers emulate most of the attributes of a real computer including hardware (CPU(s) & GPU(s) for processing, local/RAM memory, hard-disk/SSD storage); a choice of operating systems; networking; and pre-loaded application software such as web servers, databases, CRM, etc. Each AWS system also virtualizes its console I/O (keyboard, display, and mouse), allowing AWS subscribers to connect to their AWS system using a modern browser. The browser acts as a window into the virtual computer, letting subscribers log-in, configure and use their virtual systems just as they would a real physical computer. They can choose to deploy their AWS systems to provide internet-based services for themselves and their customers.

III. Information Gain:

USDA(United State Department Of Agricultural)

<https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/nutrient-data-laboratory/docs/sr28-download-files/>



The USDA National Nutrient Database for Standard Reference (SR) is the major source of food composition data in the United States. It provides the foundation for most food composition databases in the public and private sectors. As information is updated, new versions of the database are released. This version, Release 28 (SR28), contains data on 8,789 food items and up to 150 food components. It replaces SR27, initially issued in August 2014 and revised in May 2015.

Updated data have been published electronically on the USDA Nutrient Data Laboratory (NDL) web site since 1992. SR28 includes composition data for all the food groups and nutrients published in the 21 volumes of “Agriculture Handbook 8” (US Department of Agriculture 1976-92), and its four supplements (US Department of Agriculture 1990-93), which superseded the 1963 edition (Watt and Merrill, 1963). SR28 supersedes all previous releases, including the printed versions, in the event of any differences. In July 2001, when NDL converted to a new version of its Nutrient Databank System (NDBS), formats were changed and fields added to improve the descriptive information for food items and the statistical information about the nutrient values. While data in previous releases have been moved to the new NDBS, they may not have been updated through the complete system. Therefore, many of these new fields contain data only for those items that have been processed through the new NDBS and it will take a number of years before they are populated for all food items in the database

SR28 Highlights

A number of studies either conducted through NFNAP or by collaboration with various groups resulted in various changes to the database. The major changes to the database since the last release are listed below. □ Nutrient profiles were added for new foods and existing nutrient profiles were updated for SR28 using data generated by USDA through the NFNAP, submitted by the food industry, or using other publicly available data. A complete list of the added food items can be found in the ADD_FOOD file and the updated nutrients in the CHG_NUTR file. The formats of these files can be found on p. 42. A major focus of this effort is to monitor those foods which are major contributors of sodium to the diet. More information on the sodium monitoring project is available on our web site (<http://www.ars.usda.gov/Services/docs.htm?docid=22861>). The Food Surveys Research Group (FSRG), in collaboration with NDL, identified a group of select foods, termed ‘Sentinel Foods’, to be monitored as primary indicators for assessing change in the sodium content of foods in the US food supply. In many cases, to reduce the sodium content of a food, the product must be reformulated using new ingredients or a different balance of ingredients, potentially affecting concentrations of nutrients other than sodium. Examples are fat, sugars, fiber, potassium, and fatty acids. Concentrations of these nutrients are also being monitored. The results of these analyses have been used to update nutrient profiles for foods in SR. An additional 1,300 foods, mainly commercially packaged and restaurant foods with added sodium used in the national dietary survey What We Eat in America (WWEIA), National Health and Nutrition Examination Survey (NHANES) are being monitored through information obtained directly from manufacturers or restaurant chains and their websites or changes in the Nutrition Facts Panel values. If there was an appreciable change in the sodium value, or any of the other aforementioned nutrients, SR was updated as needed.

Food Descriptions

This file includes descriptive information about the food items. For more details on the format of the Food Description file, see “Food Description File Formats” (p. 29). A full description (containing the name of the food with relevant characteristics, e.g., raw or cooked, enriched, color) and a short description (containing abbreviations) are provided. Abbreviations used in creating short descriptions are given in Appendix A. In creating the short description, the first word in the long description is not abbreviated. In addition, if the long description is 25 characters or less, the short description contains no abbreviations. Abbreviations used elsewhere are given in Appendix B. Brand names used in food descriptions are in upper case. Scientific names, common names, manufacturers’ names, amounts of refuse, and refuse descriptions are provided where appropriate. The common name field includes alternative names for a product, e.g., soda or pop, for a carbonated beverage. In addition this field also includes Uniform Retail Meat Identity Standard (URMIS) identification numbers and USDA commodity codes as appropriate. The food group to which the food item belongs is also indicated. A code is also provided indicating if the item is used in the Food and Nutrient Database for Dietary Studies (FNDDS; USDA, ARS, 2014). The factors used to calculate protein from nitrogen are included, as well as those used to calculate kilocalories. There are no factors for items prepared using the recipe program of the NDBS or for items where the manufacturer calculates protein and kilocalories. The refuse and refuse description fields contain amounts and descriptions of inedible material (for example, seeds, bone, and skin) for applicable foods. These amounts are expressed as a percentage of the total weight of the item as purchased, and they are used to compute the weight of the edible portion. Refuse data were obtained from NFNAP and other USDA-sponsored contracts and US Department of Agriculture Handbooks 102 (Matthews and Garrison, 1975) and 456

(Adams, 1975). To calculate the “amount of nutrient in edible portion of 1 pound (453.6 grams) as purchased,” use the following formula:

$$Y = V * 4.536 * [(100 - R) / 100]$$

where:

Y = nutrient value per 1 pound as purchased

V = nutrient value per 100 g (Nutr_Val in the Nutrient Data file), and

R = percent refuse (Refuse in the Food Description file).

For meat cuts containing bone and connective tissue, the amount of connective tissue is included in the value given for bone. Separable fat is not shown as refuse if the meat is described as separable lean and fat. Separable fat generally refers to seam fat and external trim fat. Separable lean refers to muscle tissue that can be readily separated from fat, bone, and connective tissue in the intact cut; it includes any fat striations (marbling) within the muscle. For boneless cuts, the refuse value applies to connective tissue or connective tissue plus separable fat. The percentage yield of cooked, edible meat from 1 pound of raw meat with refuse can be determined by using the following formula:

$$Y = (Wc / 453.6) * 100 \text{ where:}$$

Y = percentage yield of cooked edible meat per 1 pound as purchased, and

Wc = weight of cooked, edible meat in grams.

Food Group. To facilitate data retrieval the food items in SR are organized into food groups. Currently there are 25 food groups, which are listed in the Food GroupDescription file. For more details on the format of this file, see “Food Group Data File Formats” (p. 31). Starting with SR25, the food group, “Ethnic Foods” has been renamed “American Indian/Alaska Native Foods” to better reflect its contents. Data on other ethnic foods are contained in their respective food groups, for example data on plantains, a Latino ethnic food are in Food Group 09 (Fruit and Fruit Juices), while the Asian foods, miso and natto, are entered in food group 16 (Legumes and Legume Products). Food group 36 (Restaurant Foods) contains foods obtained from casual dining, full service restaurants, Latino restaurants, and Chinese restaurants (not FastFoods, which are in Food Group 21). Home prepared items or prepared frozen entrees are included in Food Group 22, Meals, Entrees, and Side dishes. Some food items, such as beverages and rice, though obtained at restaurants are included in their respective food groups.

Nutrients

The Nutrient Data file contains mean nutrient values per 100 g of the edible portion of food, along with fields to further describe the mean value. The following statistical attributes are provided to better describe the data:

- Nutrient value—the mean of the data values for a specific parameter. Nutrient values have been rounded to the number of decimal places for each nutrient as specified in the Nutrient Definition file (p. 34).
- Number of data points—the number of data points used to estimate the mean.
- Standard error—the standard error of the mean: a measure of variability of the mean value as a function of the number of data points.
- Number of studies—the number of analytical studies used to generate the mean. A study is a discrete research project conducted or reported for a specific food. A study can be the analysis of one nutrient in one food, one nutrient in many foods, or many nutrients in many foods.*

Table 1.—Number of Foods in the Database (n = 8,789) Containing a Value for the Specified Nutrient

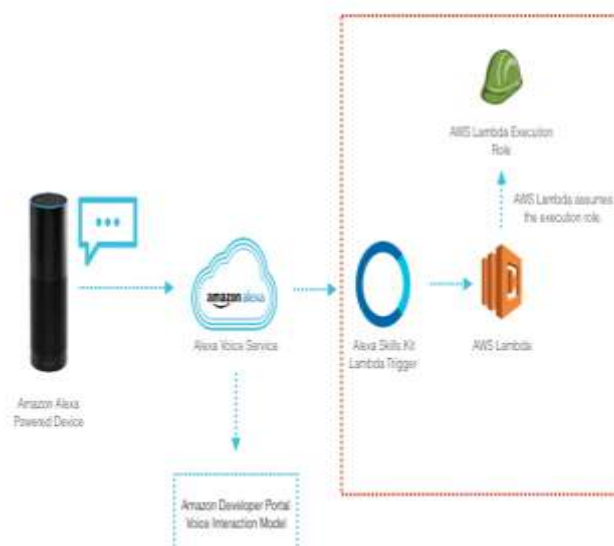
Nutr. No	Nutrient	Count
255	Water *†	8788
208	Energy *†	8789
268	Energy	8756
203	Protein *†	8789
257	Adjusted Protein	4
204	Total lipid (fat) *†	8789
207	Ash *†	8464
205	Carbohydrate, by difference *†	8789
291	Fiber, total dietary *†	8195
269	Sugars, total *†	1743
210	Sucrose	1752
211	Glucose (dextrose)	1753
212	Fructose	1731
213	Lactose	1719

214	Maltose	1601
287	Galactose	1180
303	Iron, Fe *†	8441
304	Magnesium, Mg *†	8645
305	Phosphorus, P *†	8050
307	Sodium, Na *†	8210
309	Zinc, Zn *†	8363
312	Copper, Cu *†	8706
315	Manganese, Mn †	8083
317	Selenium, Se *†	7532
313	Fluoride, F	6629
401	Vitamin C, total ascorbic acid *†	7971
404	Thiamin *†	8155
405	Riboflavin *†	8173
406	Niacin *†	8152
410	Pantothenic acid	6544
415	Vitamin B6 *†	7884
417	Folate, total *†	6750
431	Folic acid *†	7021
432	Folate, food *†	6732
435	Folate, DFE *†	5773
421	Choline, total *†	2084
454	Betaine	7596
418	Vitamin B12 *†	4931
578	Vitamin B12, added *	7254
320	Vitamin A, RAE *†v	6983
319	Retinol *†	5627
321	Carotene, beta *†	5627
322	Carotene, alpha *†	5531
334	Cryptoxanthin, beta *†	5519
318	Vitamin A, IU *†	5497
337	Lycopene	5497

IV. Architecture

The system architecture consists of five major parts:

- 1) Amazon alexa device
- 2) Voice Services API
- 3) Alexa skill kit lambda trigger
- 4)AWS lambda
- 5)Amazon developer portal voice interaction model



- ▶ You can develop and host your own cloud-based web service, but it is just a lot easier to use Amazon’s AWS Lambda; which is free for the first million calls per month. The Amazon AWS Command Line Interface allows use of the terminal to quickly publish the Lambda functions. Anyone developing Alexa Skills should use the Alexa Skills Kit SDK for Node.js (Alexa -sdk).

- ▶ Inspired by the Amazon Echo (Alexa) platform and its potential in Healthcare
- Voice communication is natural for people
- The new UI is “no UI” i.e. VOICE
- Echo is a customizable, programmable platform

Amazon Echo Dot



V. Other Components

- 1) Web services and APIs: For providing web services, we will build up web services and APIs for getting results from services layers. This component will be on the layer of communication.
- 2) User Interface: Our main Users are people doctors or senior nursing and senior citizens & family members. We have developed FOOD NUTRITION SKILL- response Web for displaying and proving more details to the Users

VI. Working

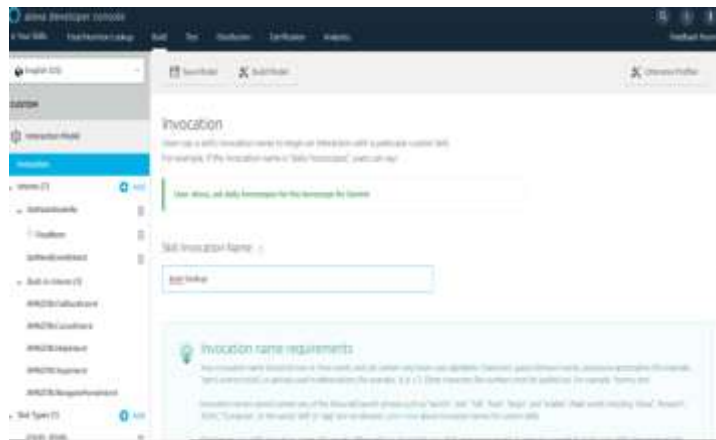
Step1: Amazon Developer portal - <https://developer.amazon.com>

- ▶ Use this skill to create an account in developer portal and then sing in
- ▶ After successful creation of account click on login
- ▶ Then you will see one window like this



- ▶ select amazon Alexa
- ▶ select Alexa skill kit -> get started->Alexa -kit
- ▶ Click on start a skill
- ▶ click on create skill
- ▶ Skill name: nutri lookup and default language is English (US)
- ▶ And choose a model to add to your skill custom because we are creating a model here or we can say custom skill
- ▶ Click on create skill then
- ▶ Now first thing in our skill is we need to give invocation name. means we need to give unique name to our skill so **Alexa service kit uniquely identify** our skill

- ▶ Now certain requirement we need to follow like if you want to publish your skill then 2 words in invocation name is mandatory and it should go with the phases like ask, tell, launch. etc
- ▶ Enter the invocation name as nutri lookup



- ▶ Then click on save model and you will get notification that successful created
- ▶ Now we need to add intent
- ▶ Intent are like something feature for our skill how may feature you want to implement, so many intents you are going to have and, in each intent, you have to give sample utterances that means how user are going to invoke our skill
- ▶ So here to start with we are adding only one feature like food nutrition so let's add and intent for that
- ▶ Give name to intent
- ▶ In our case we are going to call it as **GetNutritionInfo** because that how we are going to identify our feature
- ▶ And click on create an intent
- ▶ Now it is asking for sample utterances.

And click on add And click on enter on keyword to add your own sample utterances.

- a. GetNextEventIntentmore
- b. GetNextEventIntentmoreinformation
- c. GetNutritionInfohowmanycaloriesarein{FoodItem}

▶ So, this are the sample utterance we are expecting from user you can add more so user have multiple way to invoke our skills and that how Alexa is going to learn this is intent is going to invoke and if user says something similar so user can pick it up

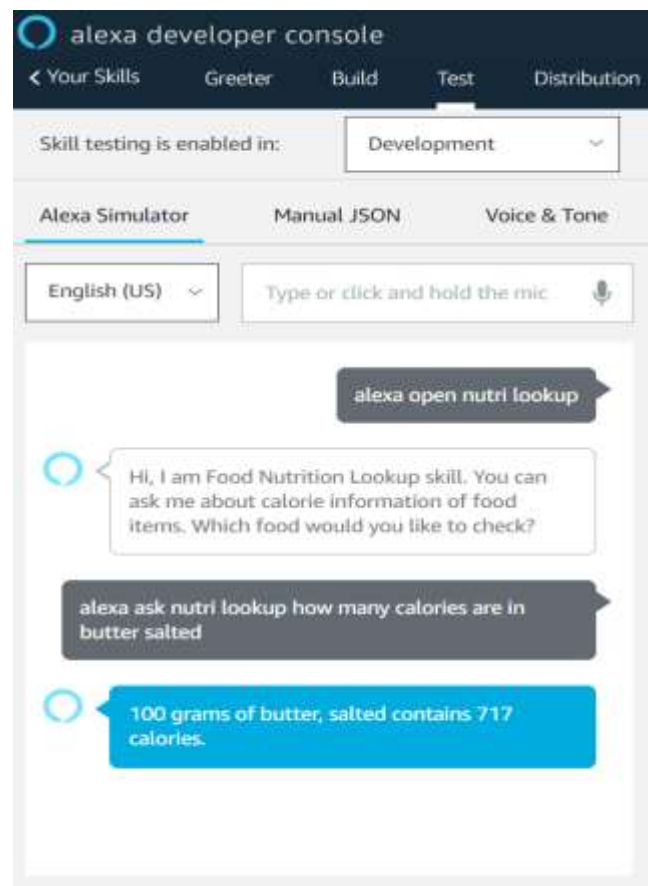
- ▶ So, we add our sample utterance and create a slot called Food_items
- ▶ Now you have to say what type of slot type it is means what you are expecting here.
- ▶ In this project here, we are expecting a name or in some other cases you might expect a number or anything so here we need to say what kind of slot type it is.
- ▶ And amazon already have lots of built-in slot type for Hollywood actor, movie and even for their name or we can say all real time use cases.
- ▶ To check how many slot types are there just use this link
- ▶ In built slot types reference - <https://developer.amazon.com/public/solutions/alexa/alexa-skills-kit/docs/built-in-intent-ref/slot-type-reference>
- ▶ But Click on slot type add
- ▶ And after clicking give a here I wanted to show you how to create custom slot type
- ▶ name here
- ▶ You can give any name but here we are using **FOOD_ITEMS** and click on custom slot type

It is not hard coded Alexa might recognize some other value and going to use it

Now go back to Food_items slot



- ▶ Now click on the slot type and you will be able to see the FOOD_ITEMS that we have created.
- ▶ And click on save model.
- ▶ Now click on build model
- ▶ So, using this information it is going to create an interaction model and we are done with building an interaction model for this one feature.
- ▶ Now got to Endpoint.
- ▶ Here we are going to add an end point and we are using lambda function as a end point
- ▶ Select lambda function and you have to give the ARN of the lambda function
- ▶ But right now, we don't have lambda function right so when we get the lambda function we will come here and select the lambda functional
- ▶ So now we are done with developing the interaction model
- ▶ One thing I would like to cover regarding the slot values here we created a food item in our slot type we add different food, so there are certain rules for this slot values let me quickly go over them.so you would know in other cases what to do
- ▶ Down you will see something like this



VII. Benefits Of This Project

“Our mission is to make it easier for people to understand what they eat. Through the launch of our Amazon Alexa skill, we are excited to enable millions of Amazon Alexa users to better understand and keep track of the foods they eat every day,”

- ▶ Your diet, or what you eat, has a huge impact on your general health in both mind and body. But conflicting information is everywhere about what you should eat, and it is hard to work out what’s best for you.
- ▶ So main goal of this skill is Knowing the calorie content of food and drink can help ensure you're not consuming too much.
- ▶ The Skill will help you how many calories are contained in 100 grams or 100 millilitres of the food or drink, so you can compare the calorie content of different products.
- ▶ You can use the calorie information to assess how a particular food fits into your daily calorie intake.
- ▶ Amazon Alexa now works with track by nutrition a cutting-edge food tracking application, to provide nutrition information for thousands of common foods. The new Alexa skill combines the power of the comprehensive Nutrition database with the accessibility of Alexa on Amazon Echo, Echo Dot, Amazon Tap or Amazon Fire TV, to make it easier than ever to navigate daily food choices.
- ▶ Through the Track skill, users are able to ask Alexa for nutrition information for over 10K+ foods from the Nutrition dataset. Use the prompt “ask nutri lookup” to ask Alexa about any of the food item
- ▶ For example you can say “Alexa ask nutri lookup how many calories are in orange”

Effortless Food Tracking

- ▶ By enabling the Track skill, you can now use Alexa to add the foods you eat right to your Nutri lookup. To use the Track skill, just go into the Alexa app, enable the skill, and then use this skill and related information will be appeared in Alexa app activity

VIII. Conclusion and Future work

This paper presented a novel approach to integrate voice services with food nutrition information. We staunchly believe that conversational user interfaces services such as voice services will play an important role in generating valuable outpatient data. The good nutrition is fundamental for people current and future health, as well as their development and learning. The benefits of developing healthy dietary and lifestyle patterns from an early age onwards can positively impact on people’s nutrition and health throughout their adult lives. Nutrition education is an important element in an overall strategy aimed at improving food security and preventing all forms of malnutrition.

1. The one possible future of food nutrition skill using alexa is people known the related information before eating their meal they know the how many calories in their food. Also they need to know how many calories you are currently consuming.
2. People get information how many calories should eat in a day

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