

Overview

Data Science projects since 2014: Pharma, Utility, Predictive Maintenance, Services
10 years US onsite: business process, ERP/BPM, management

	Business impact & solution overview	Deep dive with code & proxy data
Cognizant	<ol style="list-style-type: none">1. 20% improvement in FLR - helpdesk tickets2. Asset reuse, ~300,000 users3. Project health measure for \$17Bn p.a. BPO projects4. Azure helpdesk chatbot	<ol style="list-style-type: none">1. Reducing call center load (ARIMA)2. Revenue leakage prevention (LSTM & BERT)
IBM	<ol style="list-style-type: none">1. Failure prediction2. Project staffing optimization	<ol style="list-style-type: none">1. Securing edge devices (T-CNN Auto Encoder)

<https://www.cognizant.com/whitepapers/optimizing-it-operations-with-natural-language-processing-codex4914.pdf>

Automatic Zoom

Digital Systems & Technology

Optimizing IT Operations with Natural Language Processing

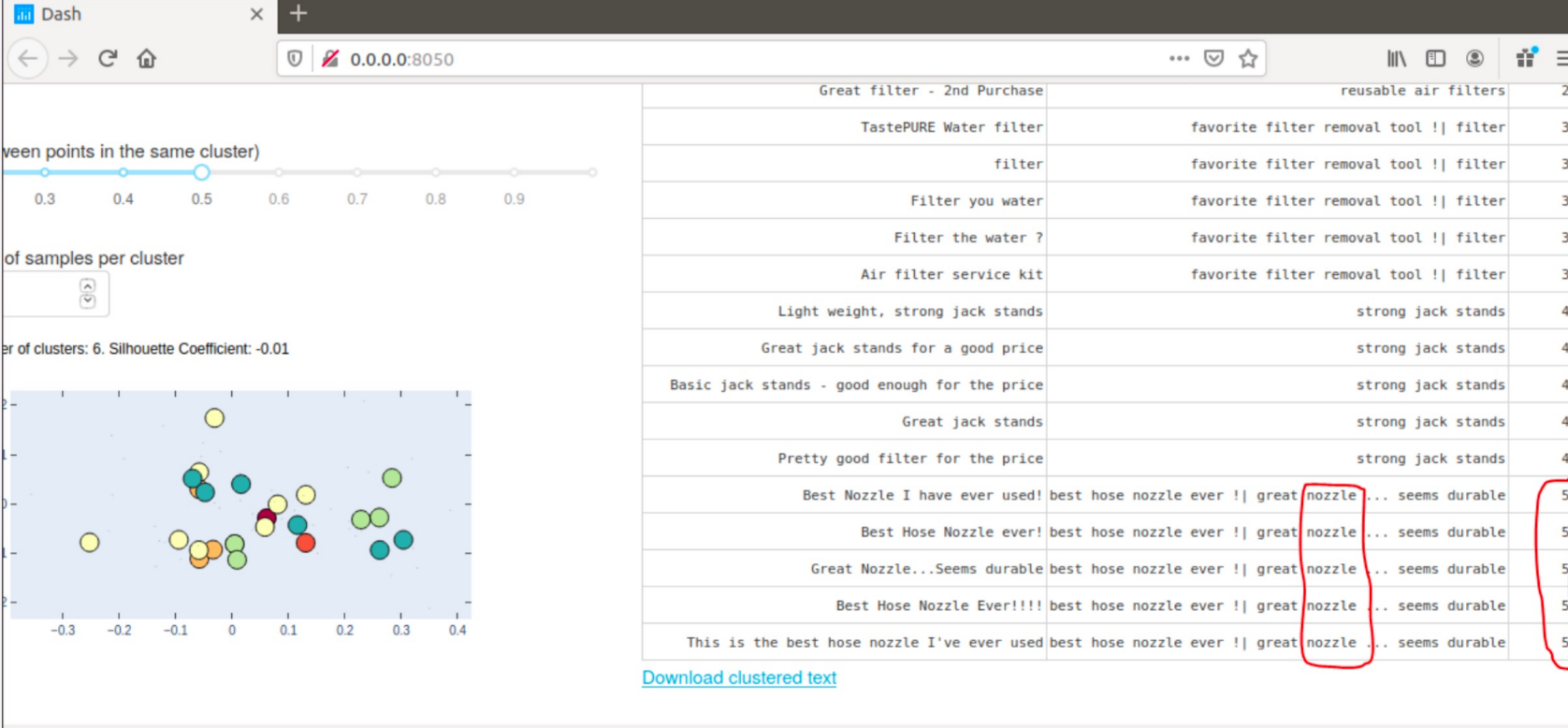
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PAPER • OPEN ACCESS

Extracting information for failure prediction from intermittent data

Balakrishna S Kesavan¹ and Amol B Mahamuni²

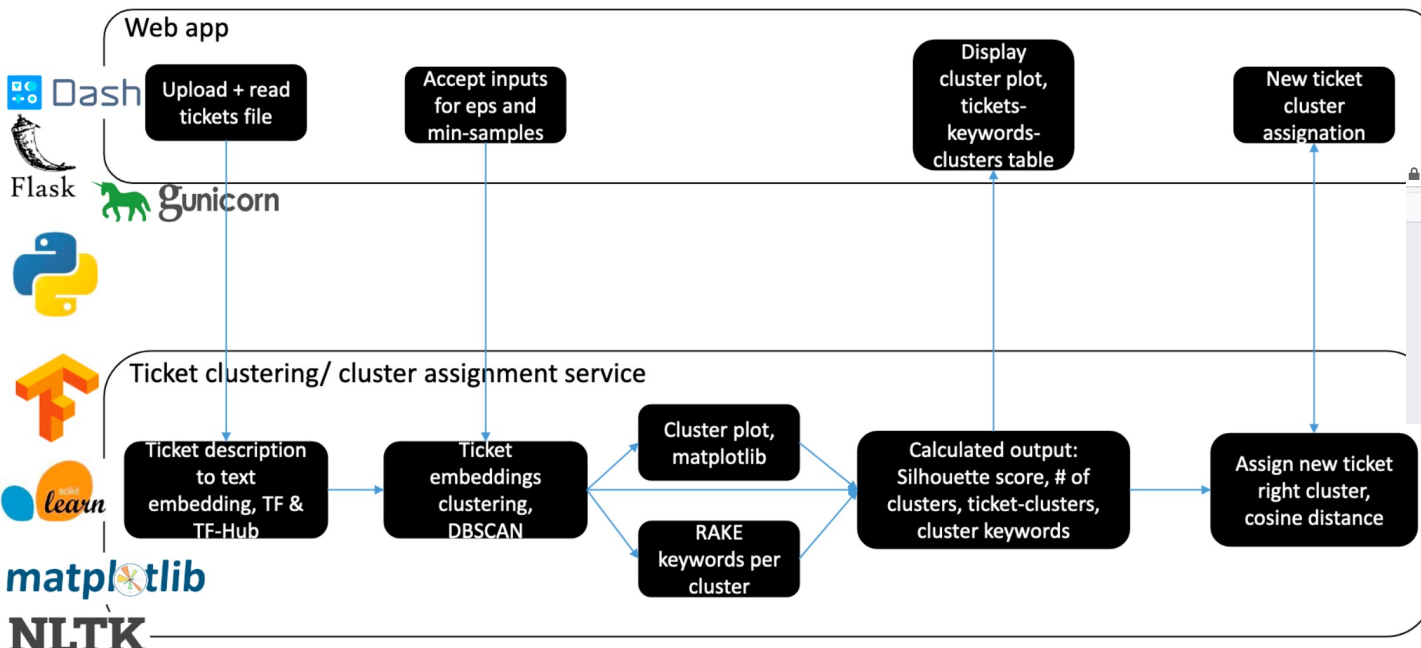


Pharma
helpdesk
left shift:

50% SME
effort
reduction

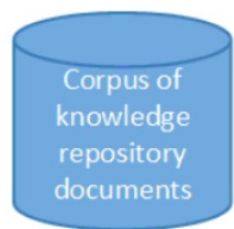
20 %
improvement
in FLR

Whitepaper



One time+ periodic update

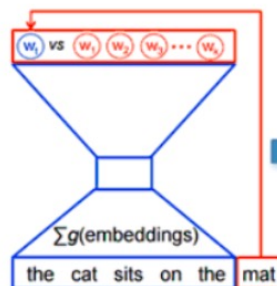
Word embedding training



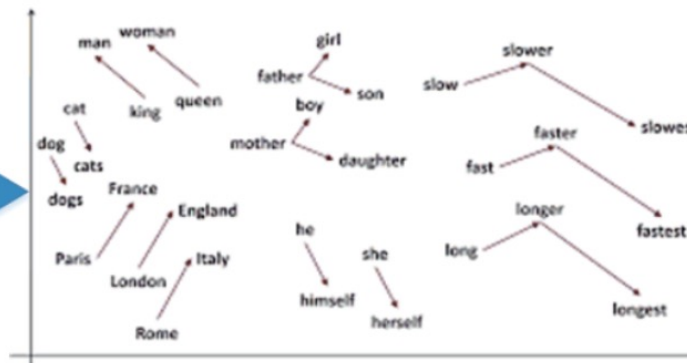
Noise classifier

Hidden layer

Projection layer



Train the neural network to pick the target word (mat) when given the context words (the cat sits on the).



Keyed vectors, composed of words and their embeddings, cluster together words that co-occur in the Cognizant specific sense. The clustering also maintains direction of co-occurrence relationships.



'Word2Vec.Tools' .NET DLL, exposes the keyed vectors as an API for similar words/n-grams look up.

KnowHub:
asset
reuse,
~300,000
users



User query phrase mapped to similar words/ phrases to help users find documents covering similar subjects (2 examples)

Cognizant

fatca

Related Keywords (Keywords are displayed based on

kyc

aml

verismart

cftc

sanctions

Pharmacovigilance

displayed based on the content available in Knowhub)

safety

surveillance

nvestments

rwe

aers

API call for similar words/ phrases






SharePoint

Survey Sentiment Analysis Dashboard for the Period 3/29/2019- 6/27/2019

Response Distribution from FLM's

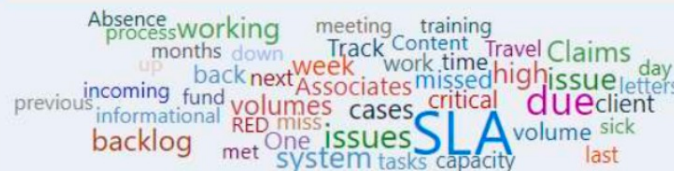


 Positive: 33.50% Vs Org 32.08%
 Neutral: 31.88% Vs Org 54.06%
 Negative: 34.62% Vs Org 13.86%

Top 3 Questions on Negative Sentiment

How likely is your customer to refer Cognizant services to others (1 being low and 10 being sure to refer)?	1
Is there any resource who is facing Health / Personal issues which you are not able to address ?	2
Was your team stressed / stretched over extended period during the month ?	3

Most Commonly used expression by FLM's



Search

Date Range Selector:



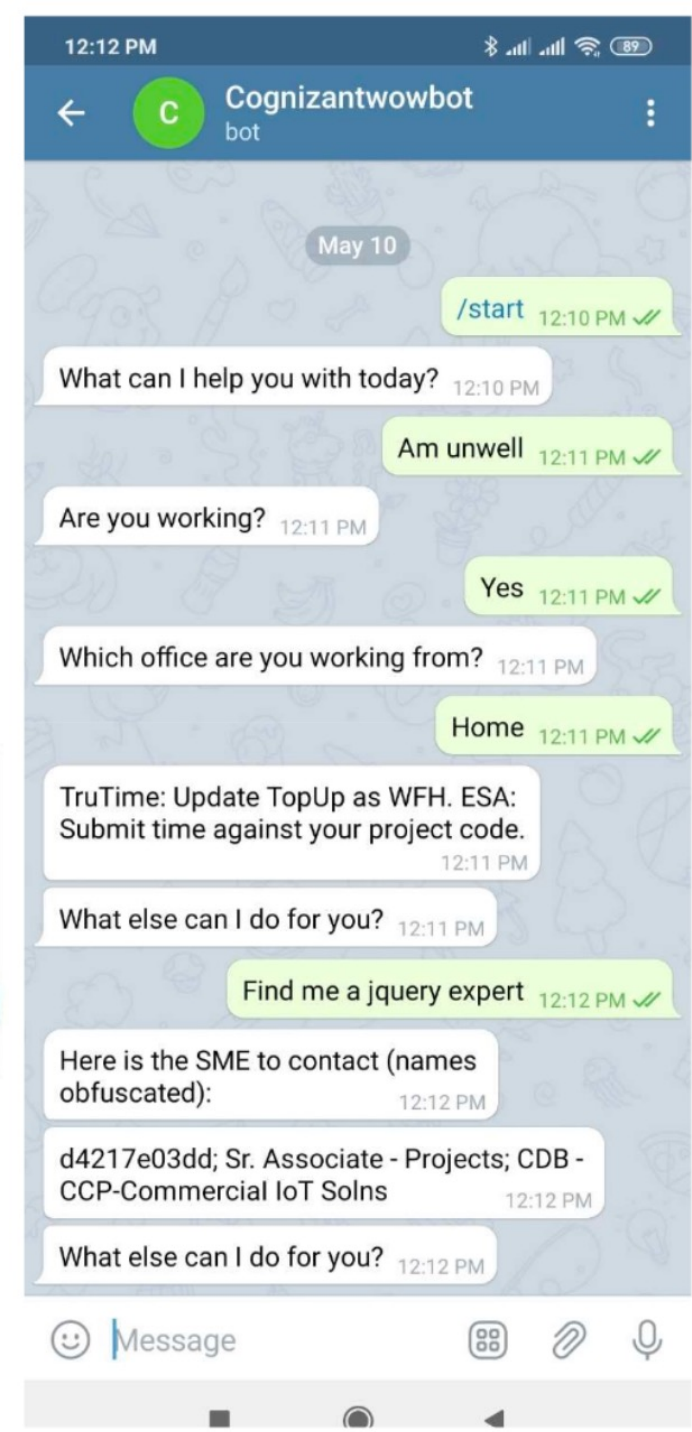
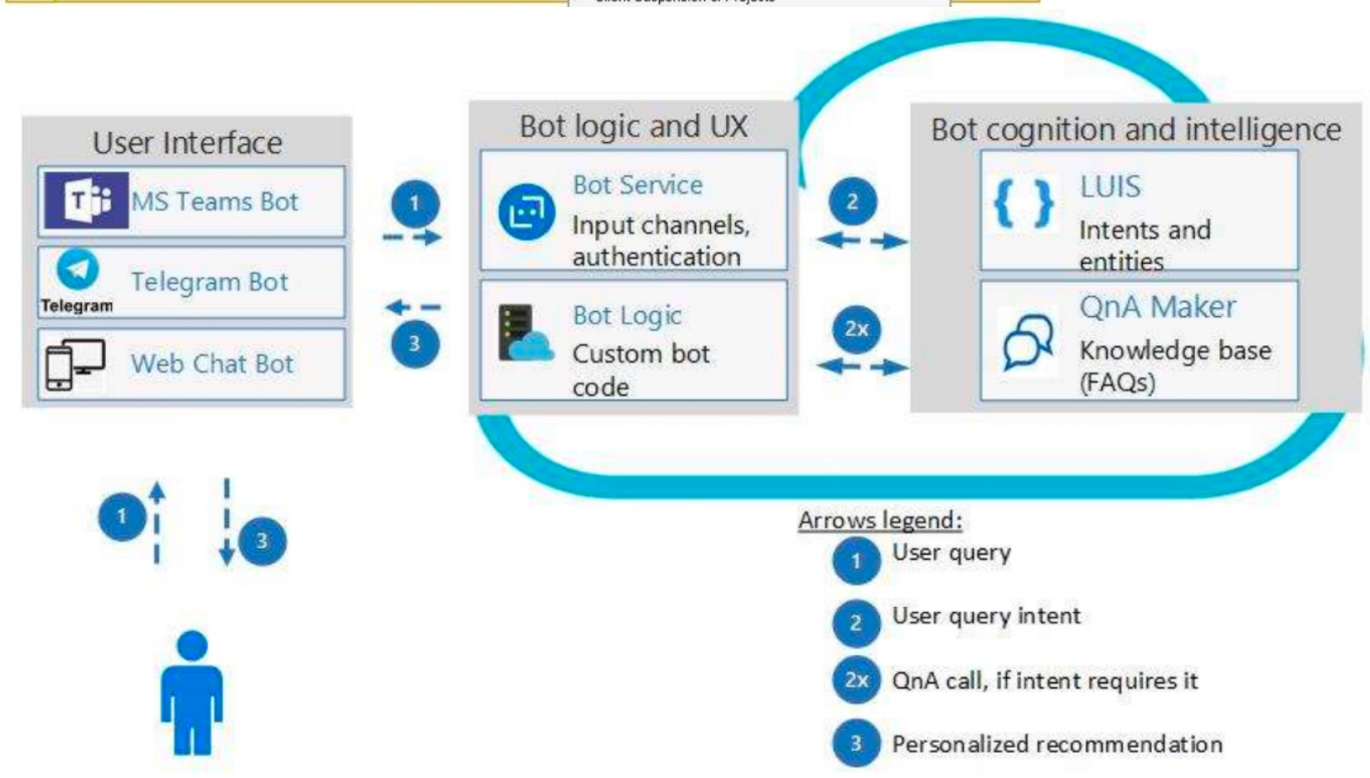
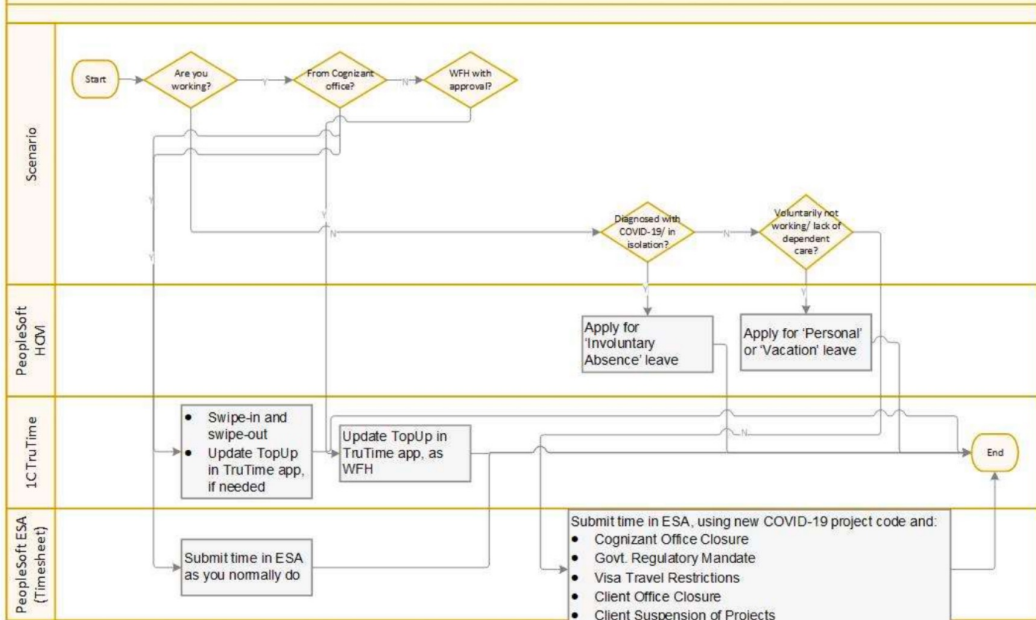
- below chart represents the trend of average positive & Negative scores across period range

```
> sentiment_by("reverse transition")
  element_id word_count sd ave_sentiment
1:          1          2 NA             0
> customSentimentBy("reverse transition")
  element_id word_count sd ave_sentiment
1:          1          2 NA    -0.7071068
```

```
> sentiment_by("no developmental feedback")
  element_id word_count sd ave_sentiment
1:          1          3 NA             0

> customSentimentBy("no developmental feedback")
  element_id word_count sd ave_sentiment
1:          1          3 NA      0.5773503
```

BPO:
project
health
measure
for
\$17Bn
p.a.
projects



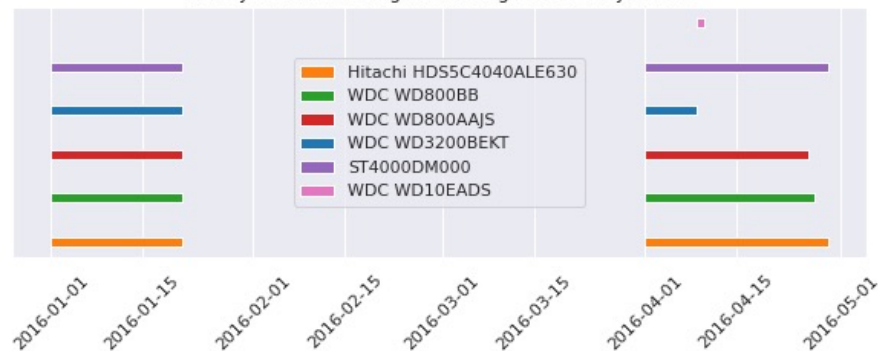
Azure
helpdesk
chatbot:

Employee
experience

Time to roll
out

IBM: Edge device failure prediction

Patchy event recordings, for a single device, by model

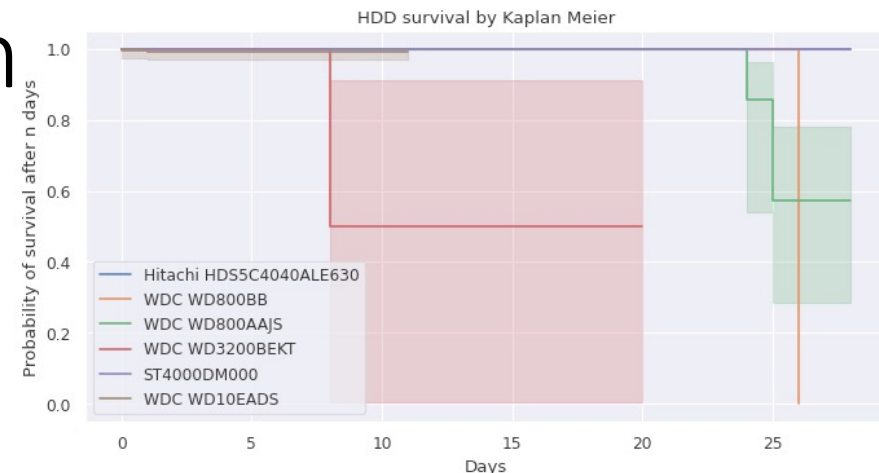


These are the failures for model WDC WD3200BEKT:

	removed	observed	censored	entrance	at_risk
event_at					
0.0	0	0	0	2	2
8.0	1	1	0	0	2
20.0	1	0	1	0	1

$$\hat{S} = \prod_{t_i < t} \frac{n_i - d_i}{n_i}$$

Day	Number of devices at risk	Number of devices failed	Survival probability (product of terms)
0	2	0	$(2-0)/2 = 1$
8	2	1	$\{(2-0)/2\} \times \{(2-1)/2\} = 0.5$
20	1	0	$\{(2-0)/2\} \times \{(2-1)/2\} \times \{(1-0)/1\} = 0.5$

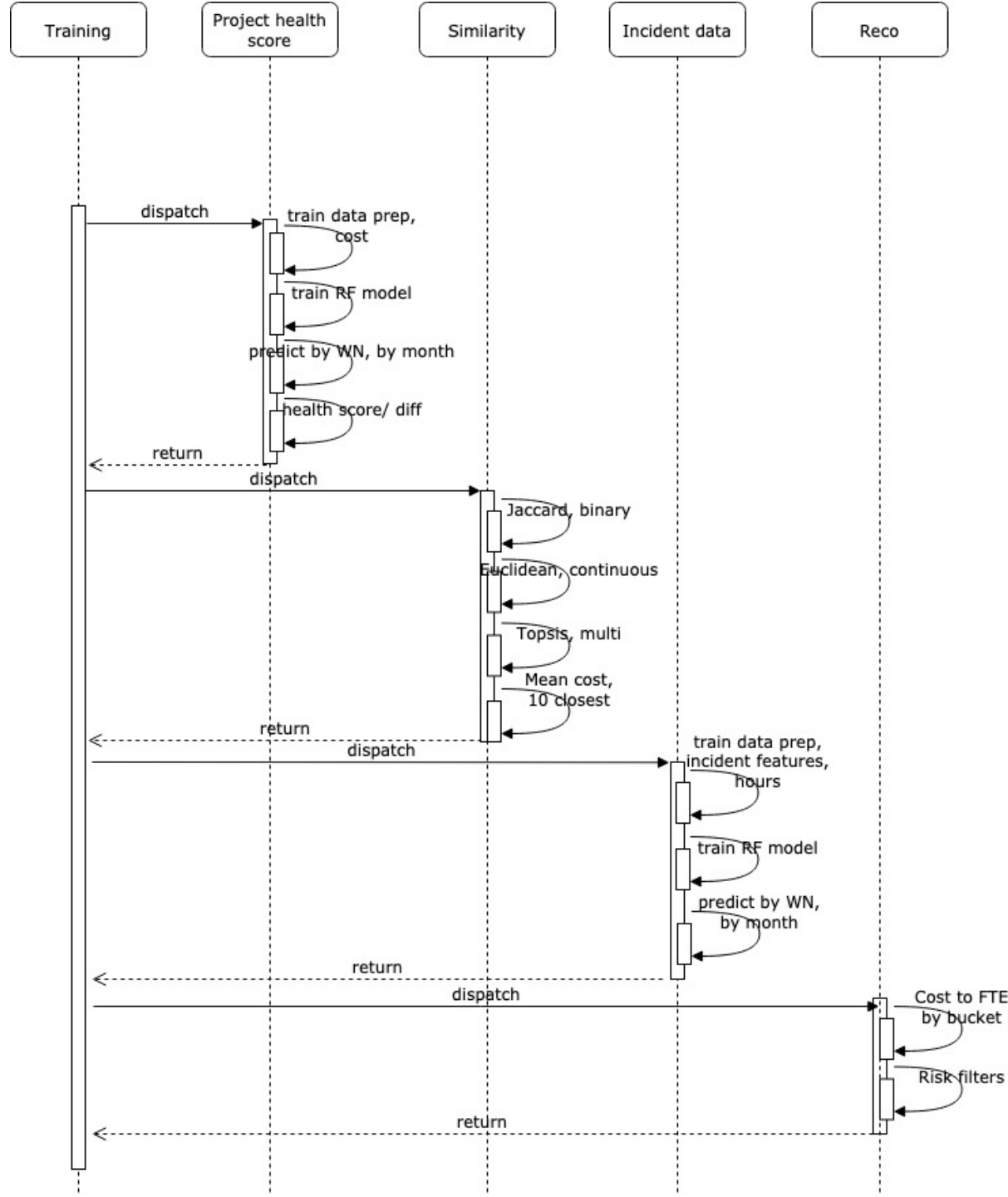


t_0	-1			
null_distribution	chi squared			
degrees_of_freedom	1			
test_name	logrank_test			
		test_statistic	p	-log2(p)
Hitachi HDS5C4040ALE630	ST4000DM000	5.41	0.02	5.64
	WDC WD10EADS	18.72	<0.005	16.01
	WDC WD3200BEKT	751.37	<0.005	547.10
	WDC WD800AAJS	799.60	<0.005	581.94
	WDC WD800BB	262.02	<0.005	193.36
ST4000DM000	WDC WD10EADS	24.96	<0.005	20.70
	WDC WD3200BEKT	389.80	<0.005	285.82
	WDC WD800AAJS	621.79	<0.005	453.49
	WDC WD800BB	90.00	<0.005	68.51
WDC WD10EADS	WDC WD3200BEKT	13.30	<0.005	11.88
	WDC WD800AAJS	0.22	0.64	0.65
	WDC WD800BB	0.05	0.83	0.27
WDC WD3200BEKT	WDC WD800AAJS	14.00	<0.005	12.42
	WDC WD800BB	3.00	0.08	3.59
WDC WD800AAJS	WDC WD800BB	0.47	0.49	1.02

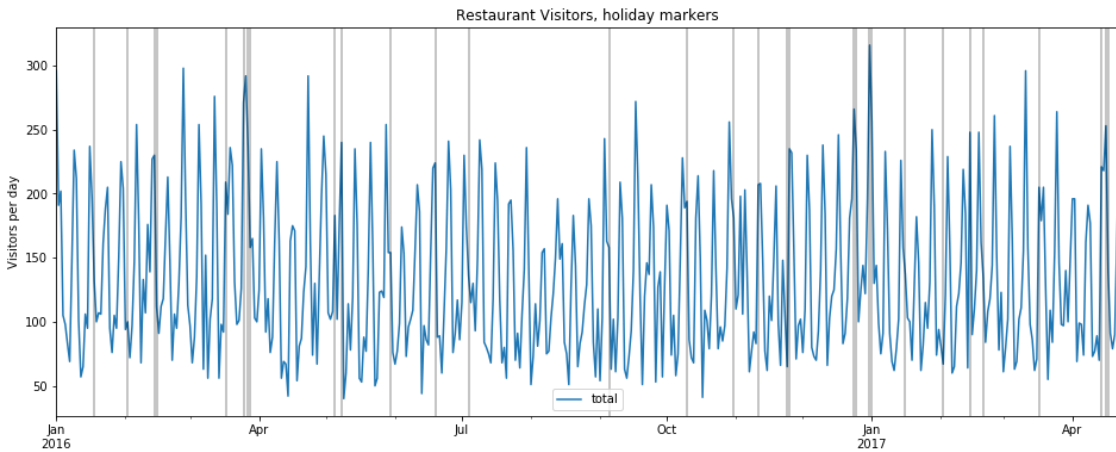
Statistical methods for automated generation of service engagement staffing plans

IBM, project staffing optimization:

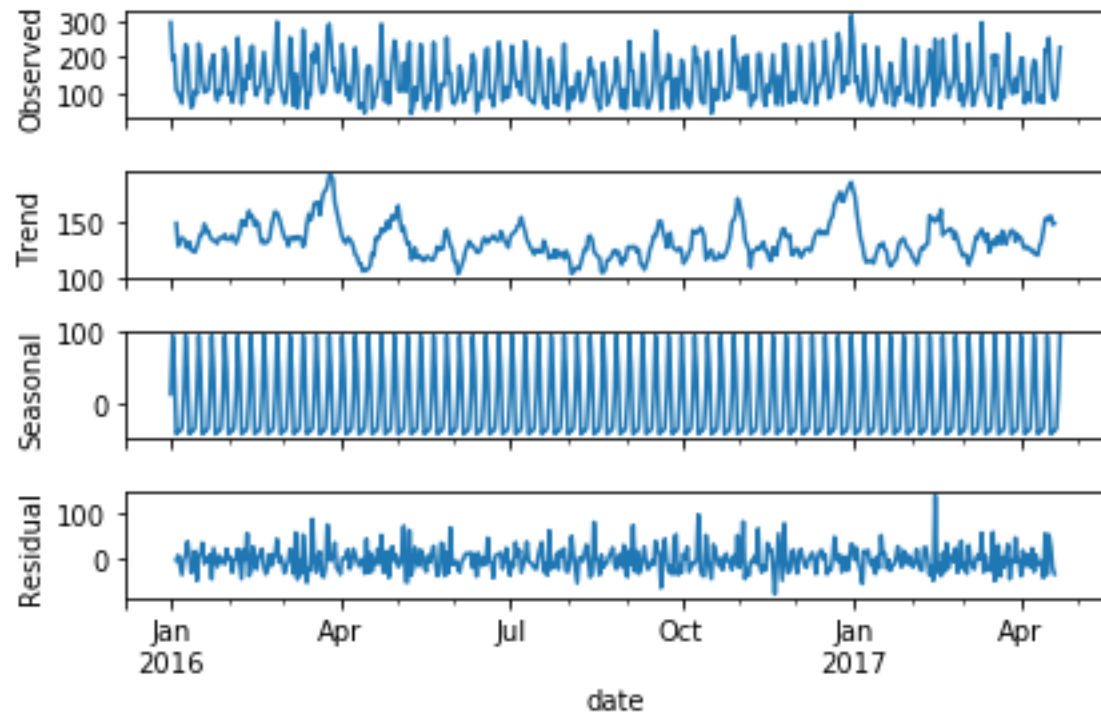
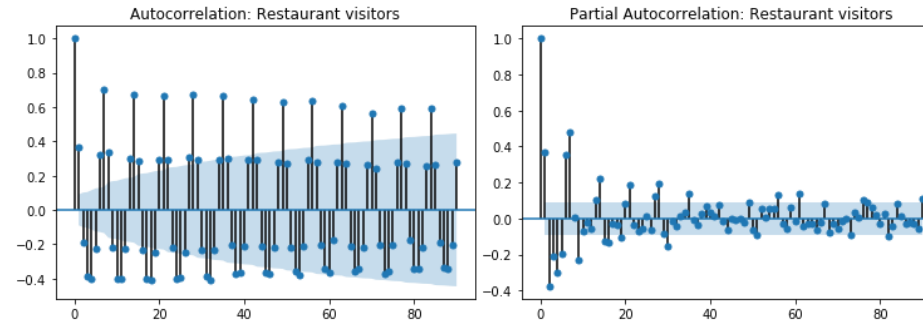
Benchmark similar + well run projects



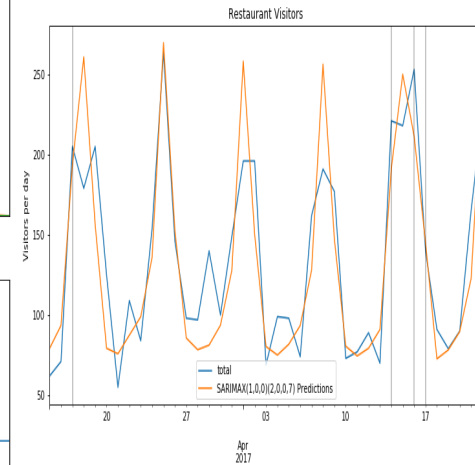
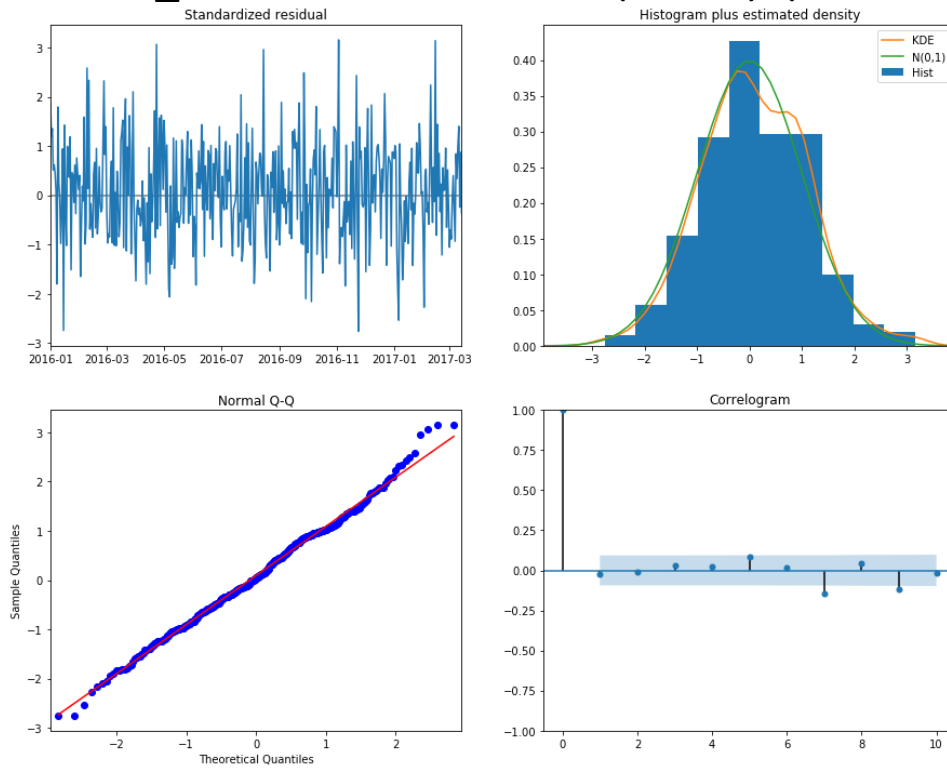
ARIMA time series analysis, restaurant employees data




Dickey Fuller test for stationarity
(-5.592496972543475, 1.319377094694142e-06)



Auto_arima recco: SARIMAX(1, 0, 0)x(2, 0, 0, 7)



HOME	DATA	DISCUSSION	SCRIPTS	SUBMISSION	LEADERBOARD
28.		Bala Kesavan			0.96127

```
#defining a bi-directional LSTM
inp = Input(shape=(maxlen,))
x = Embedding(max_features, embed_size, weights=[embedding_matrix])(inp)
x = Bidirectional(LSTM(50, return_sequences=True, dropout=0.05, recurrent_dropout=0.05))(x)
x = Bidirectional(LSTM(50, return_sequences=True, dropout=0.05, recurrent_dropout=0.05))(x)
x = GlobalMaxPool1D()(x)
x = Dense(50, activation="relu")(x)
x = Dropout(0.1)(x)
x = Dense(10, activation="sigmoid")(x)
model = Model(inputs=inp, outputs=x)
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

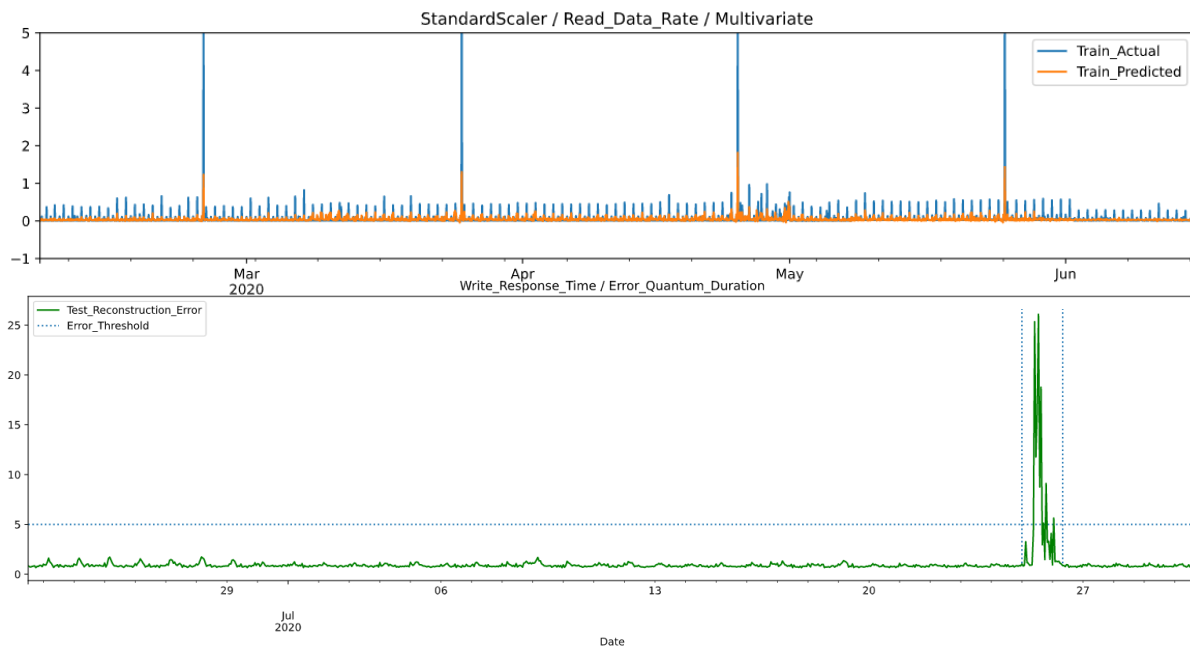
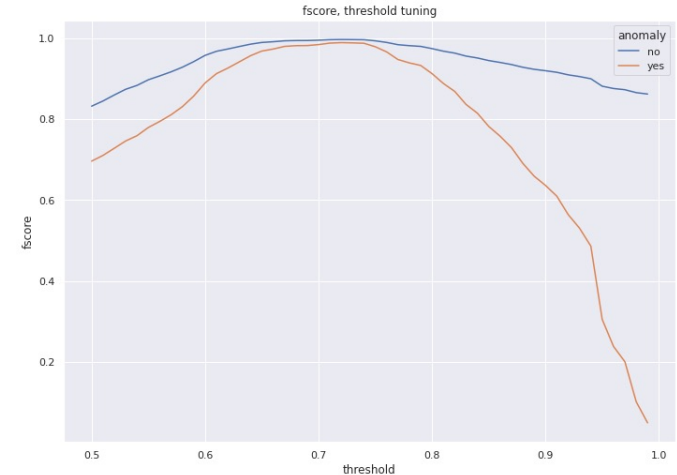
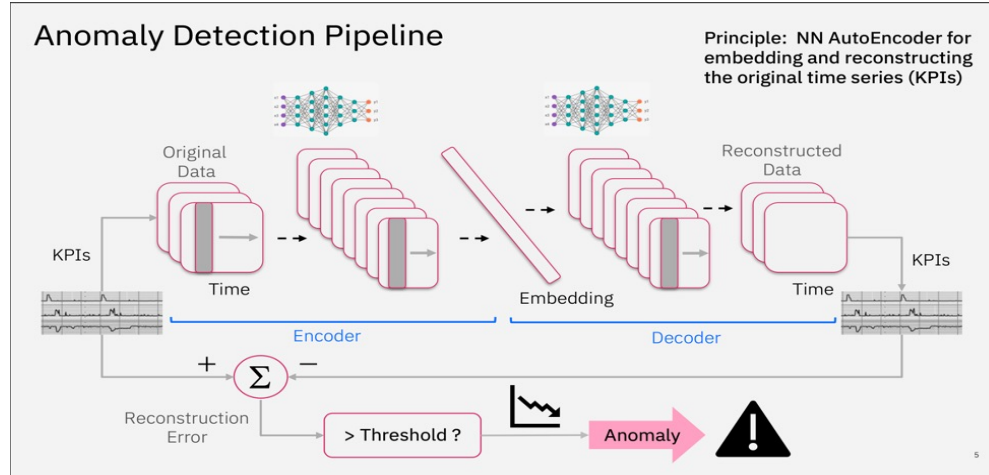
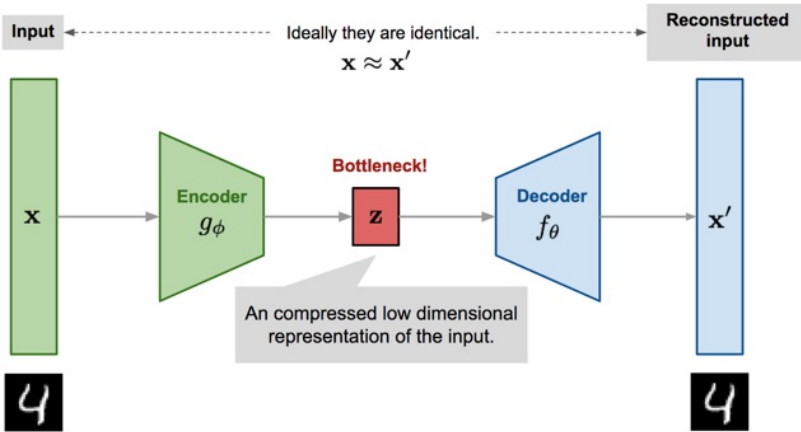
label	precision	recall	fscore	support
0	0.94	0.91	0.93	598
1	0.78	0.80	0.79	99
2	0.93	0.93	0.93	395
3	0.96	0.96	0.96	196
4	0.92	0.93	0.92	492
5	0.83	0.89	0.86	482
6	0.87	0.86	0.87	118
7	0.78	0.73	0.75	162
8	0.92	0.73	0.81	151
9	0.75	0.86	0.80	154

Obligations
extraction
from
contracts:

Prevent
revenue
leakage

Proxy data,
hackathon
entry

Text classifier:
BERT + TF2.0,
LSTM + Keras



Layer (type)	Output Shape	Param #
conv1d_3 (Conv1D)	(None, 24, 64)	30784
dropout_4 (Dropout)	(None, 24, 64)	0
conv1d_4 (Conv1D)	(None, 12, 32)	12320
dropout_5 (Dropout)	(None, 12, 32)	0
conv1d_5 (Conv1D)	(None, 6, 16)	3088
conv1d_transpose_4 (Conv1DTr	(None, 12, 16)	1552
dropout_6 (Dropout)	(None, 12, 16)	0
conv1d_transpose_5 (Conv1DTr	(None, 24, 32)	3104
dropout_7 (Dropout)	(None, 24, 32)	0
conv1d_transpose_6 (Conv1DTr	(None, 48, 64)	12352
conv1d_transpose_7 (Conv1DTr	(None, 48, 80)	30800
Total params: 94,000		
Trainable params: 94,000		
Non-trainable params: 0		

IBM edge device,
anomaly detection:

Impending failure

Device security