

Overview

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

	Tabular data	Text
ML	<ol style="list-style-type: none">1. Reducing call center load (ARIMA)2. Failure prediction (survival)3. Optimizing project staffing (RF)	<ol style="list-style-type: none">1. Measuring project health (polarity & valence)2. Azure helpdesk chatbot (cloud)
DL	<ol style="list-style-type: none">1. Securing edge devices (T-CNN Auto Encoder)	<ol style="list-style-type: none">1. FLR improvement helpdesk tickets (TFHub, DBSCAN)2. Asset reuse (Word2Vec)3. Preventing revenue leakage (LSTM & BERT)

<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**

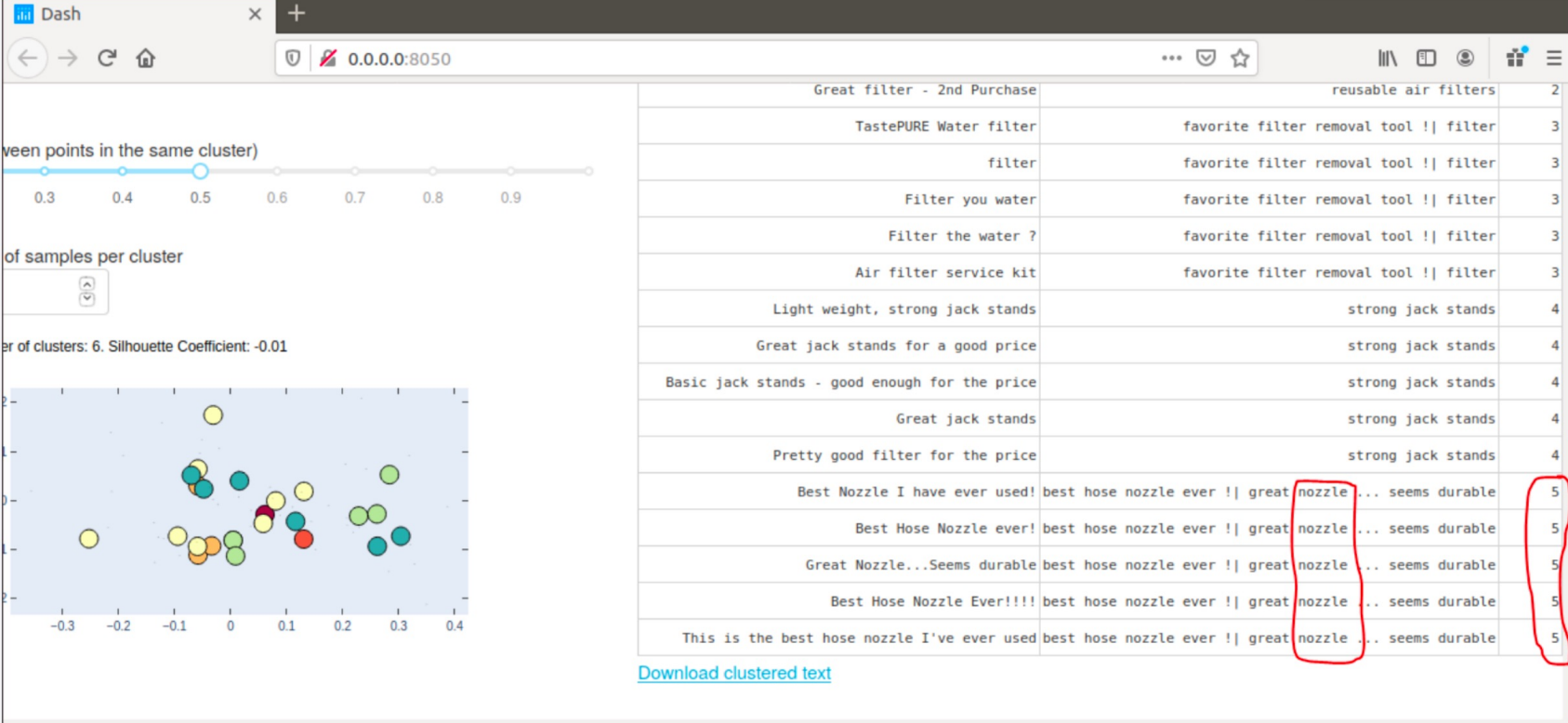
IOPscience Journals Books Publishing Support Login

IOP Conference Series: Materials Science and Engineering

PAPER • OPEN ACCESS

Extracting information for failure prediction from intermittent data

Balakrishna S Kesavan¹ and Amol B Mahamuni²

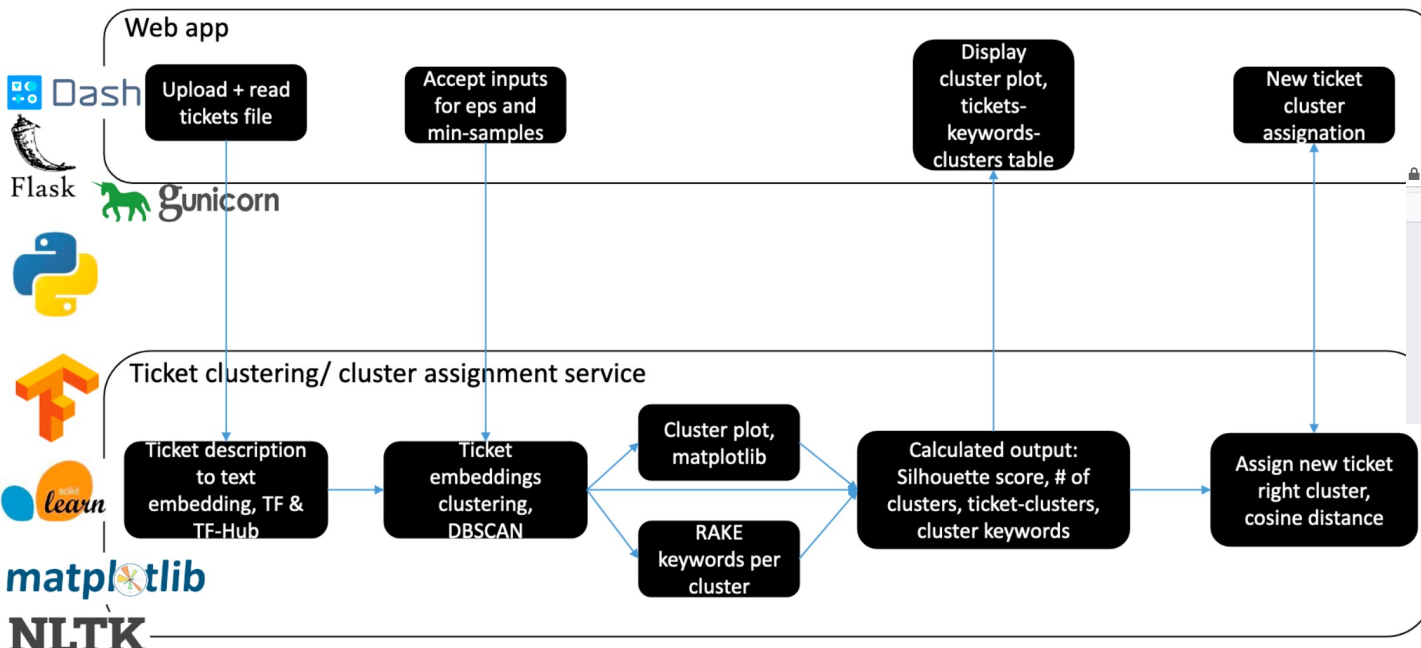


Pharma
helpdesk
left shift:

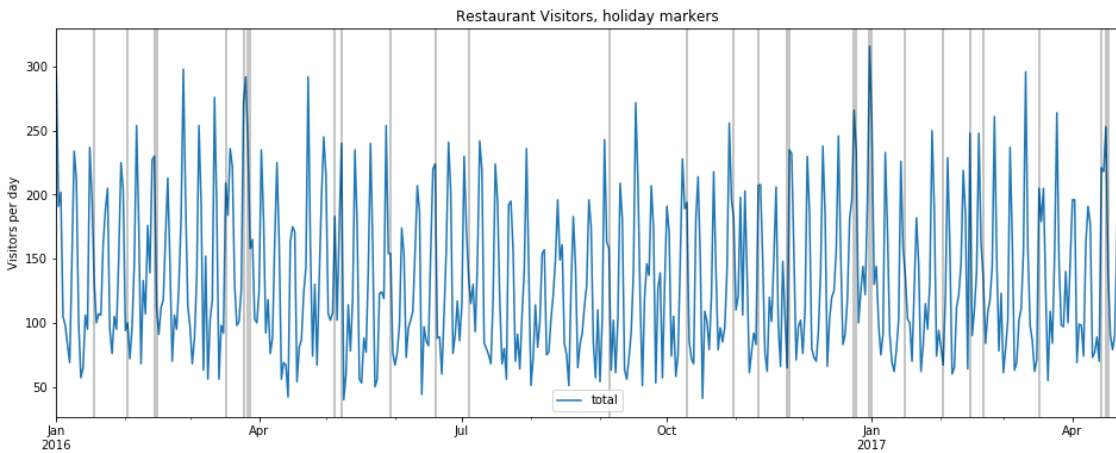
50% SME
effort
reduction

20 %
improvement
in FLR

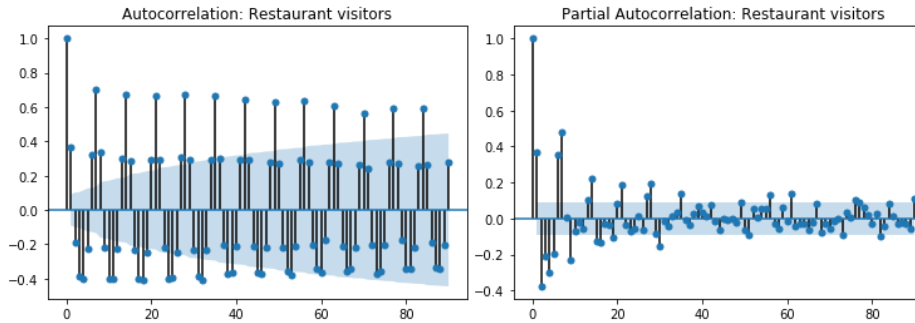
Whitepaper



Reducing call center load - utility client serving ~10Mn consumers, ARIMA

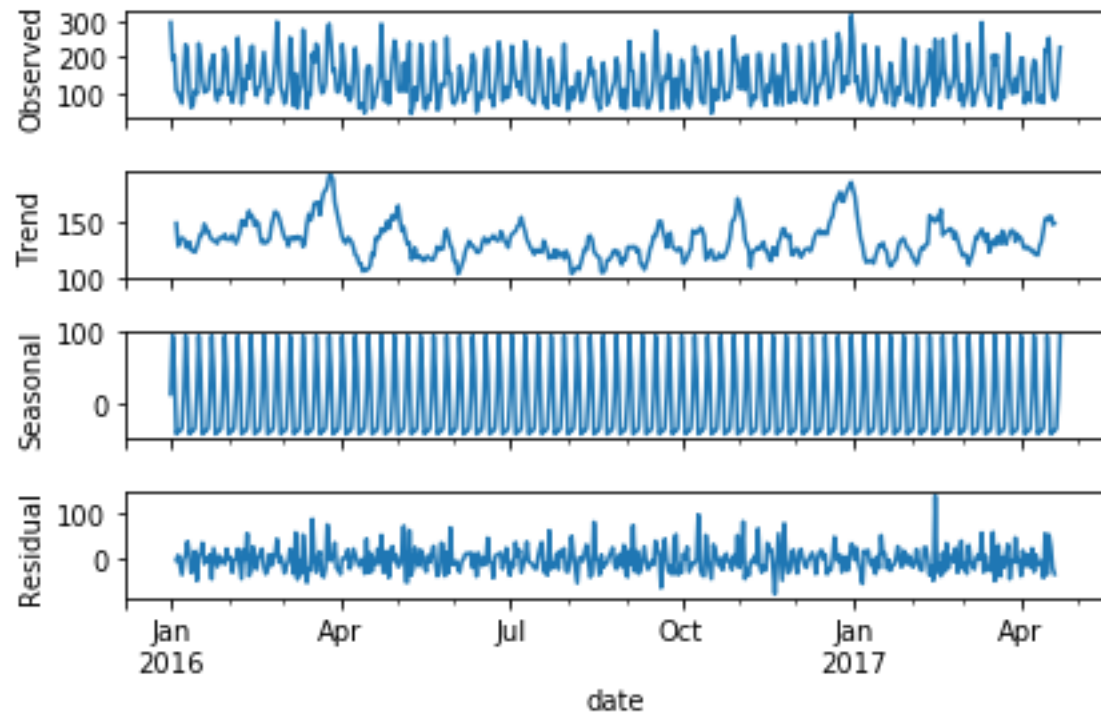


Augmented Dickey Fuller test for stationarity
(-5.592496972543475, 1.319377094694142e-06)

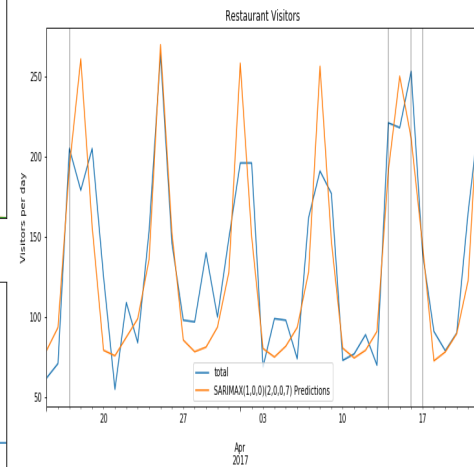
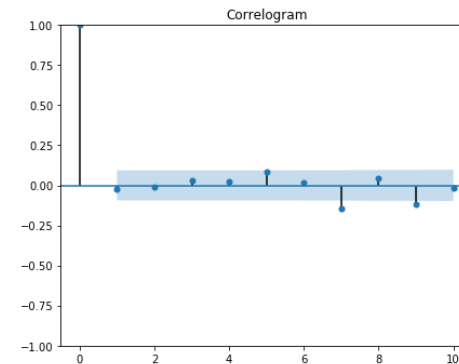
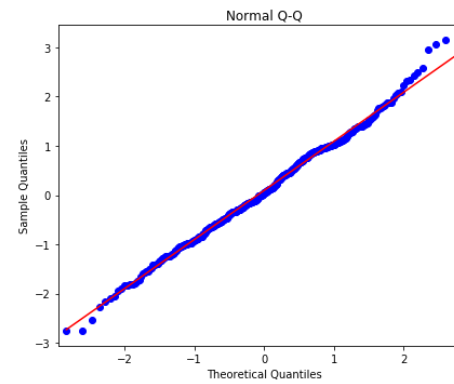
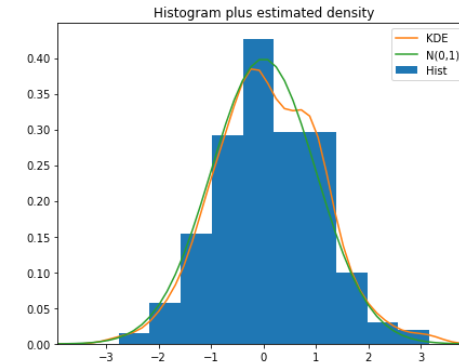
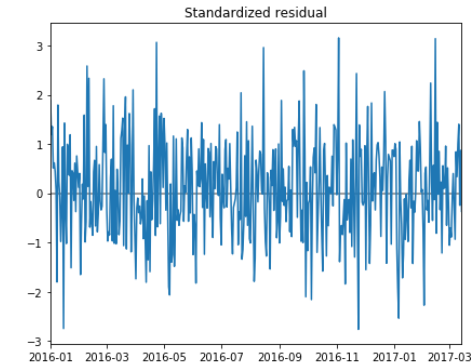


Domestic electric

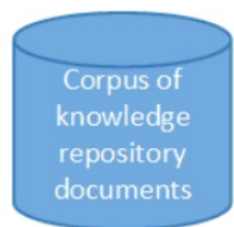
- Annual seasons
- School vacations
- Zip code
- Temperature



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



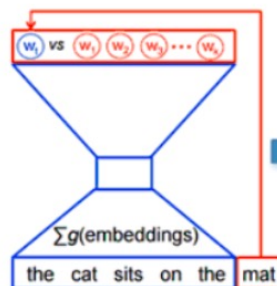
Word embedding training



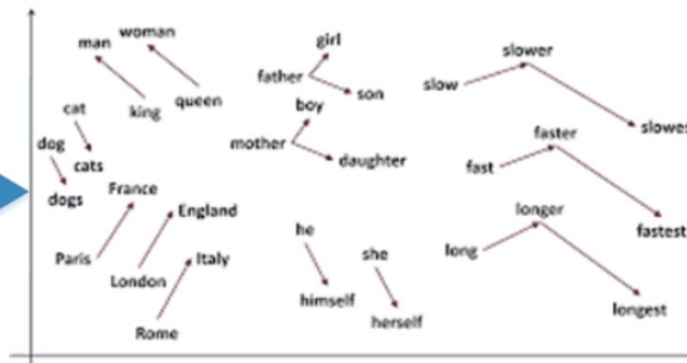
Noise classifier

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.

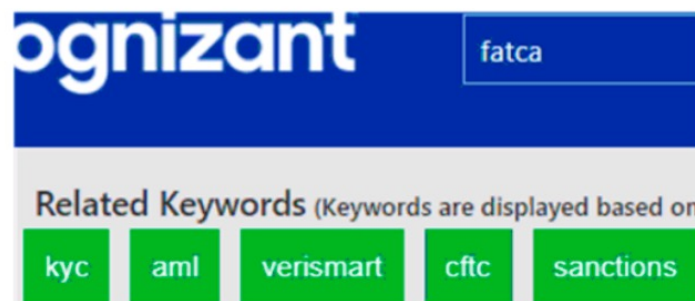


'Word2Vec.Tools' .NET DLL, exposes the keyed vectors as an API for similar words/n-grams look up.

KnowHub:
asset
reuse,
~300,000
users



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



API call for similar words/ phrases



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%

FLM Survey Responses

1. Vertical	2. Account	3. Project Name	4. Region	5. Location	6. Cluster	FLM_Name
INS	VOYA	VOYA RL CCC	APAC	Manila	Technology	ESGUERRA, D...
INS	AIG	AIG Collections BPO	APAC	Manila	People	Gary Oliver Ti...
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	Customer	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.
INS	ESIS INC	ESIS INC CASE TRIAGE	APAC	Manila	People	Jessica Jovella.

Top 3 Questions on Negative Sentiment

Question	Ranking
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
    
```

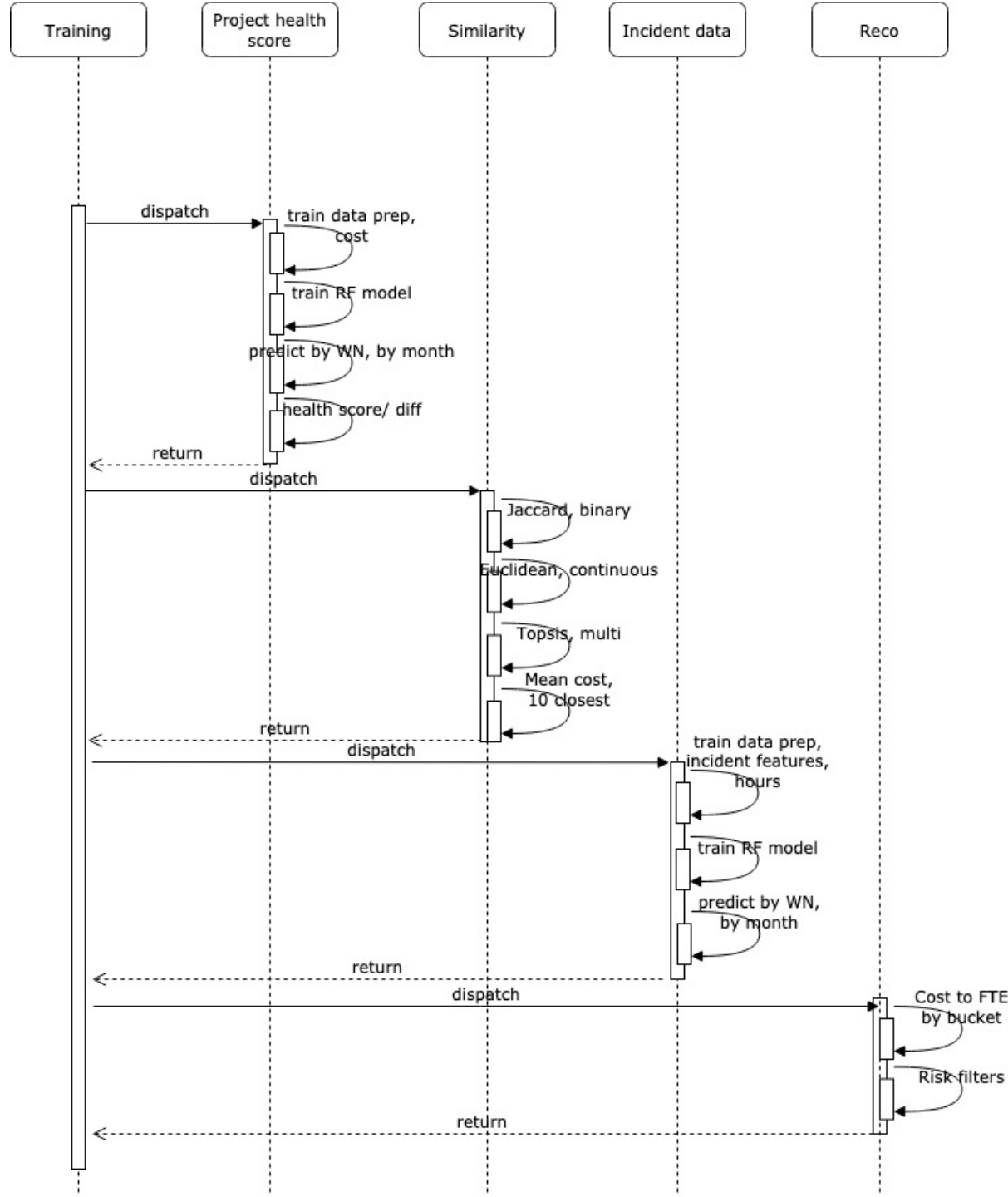
BPO:
project
health
measure
for
\$17Bn
p.a.
projects


Statistical methods for automated generation of service engagement staffing plans

Optimizing project staffing :

Benchmark similar + well run projects

Identified 8% labor cost savings



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'])
```

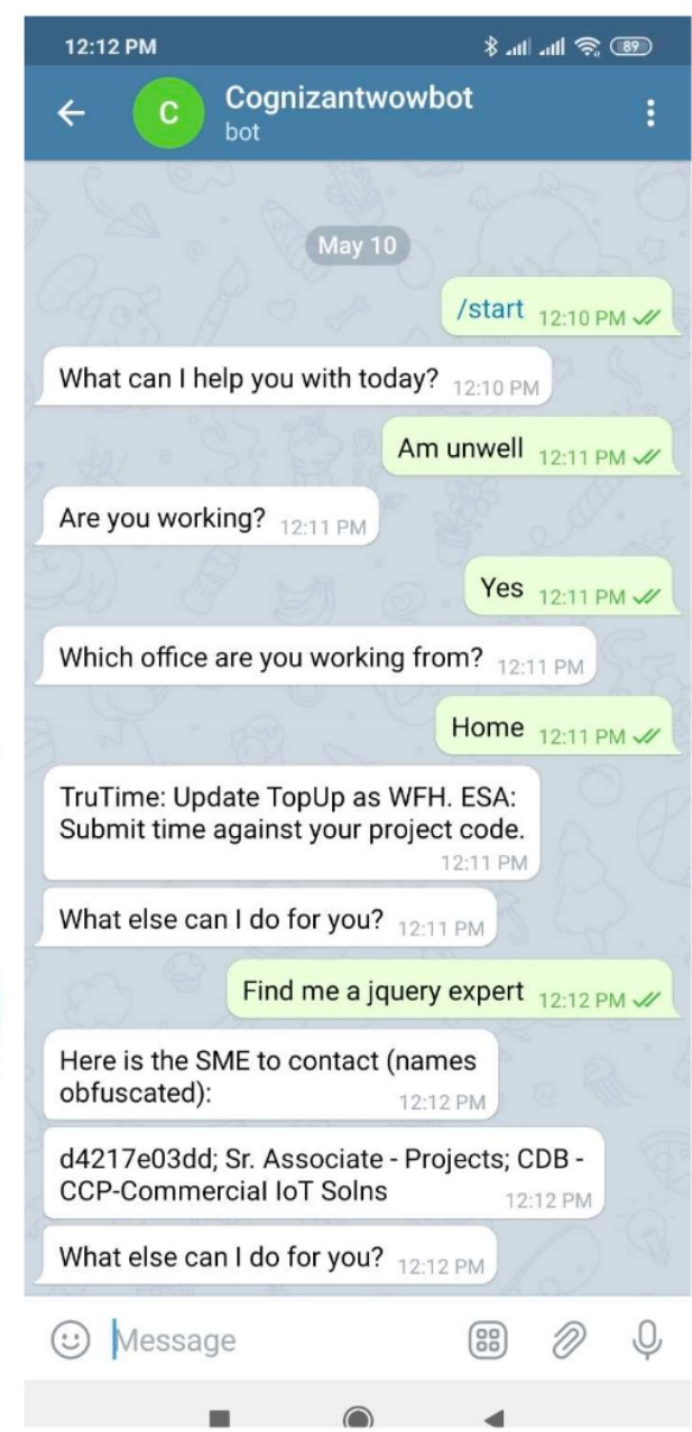
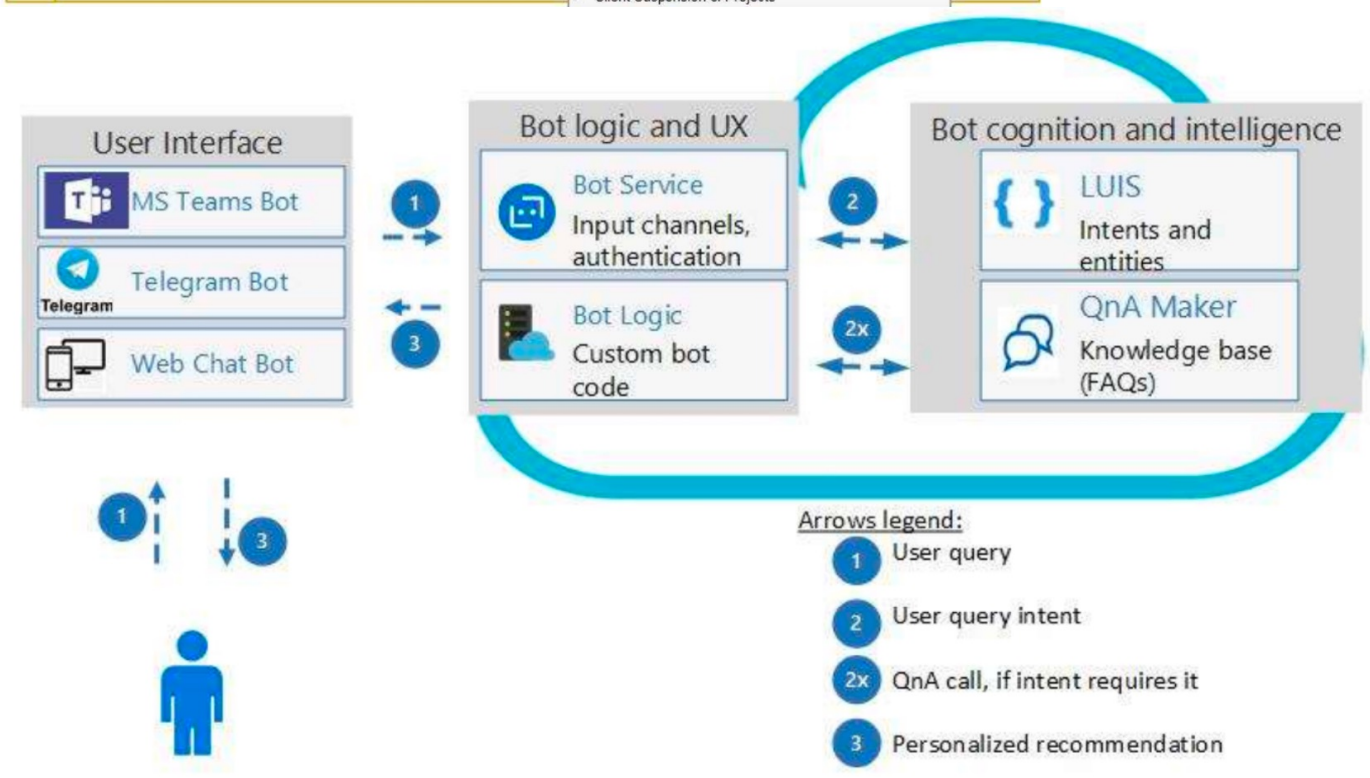
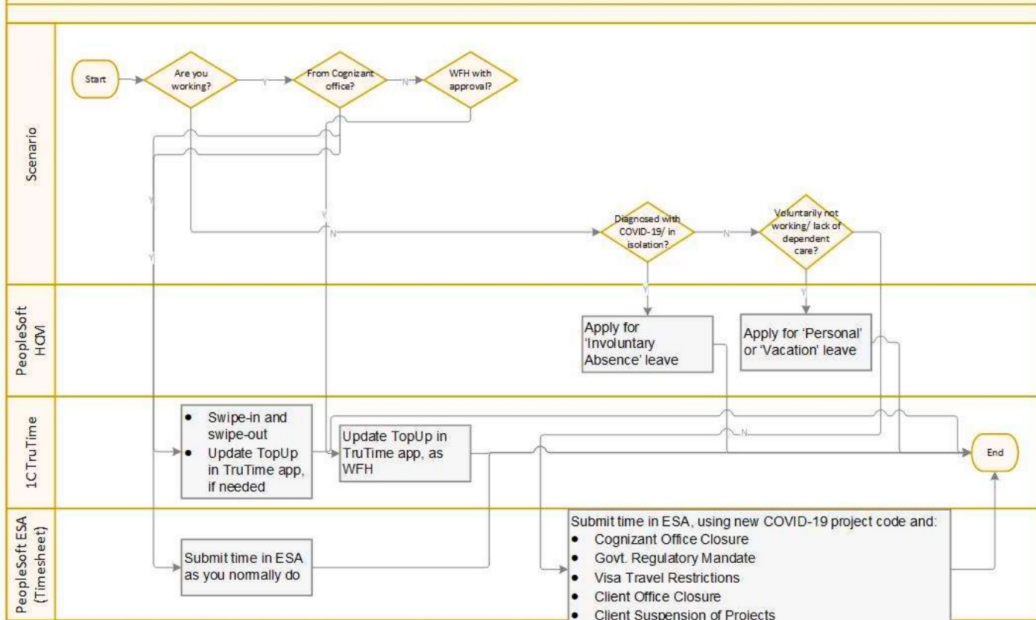
label	precision	recall	fscore	support
0	0.94	0.91	0.93	598
1	0.78	0.80	0.79	99
2	0.93	0.93	0.93	395
3	0.96	0.96	0.96	196
4	0.92	0.93	0.92	492
5	0.83	0.89	0.86	482
6	0.87	0.86	0.87	118
7	0.78	0.73	0.75	162
8	0.92	0.73	0.81	151
9	0.75	0.86	0.80	154

Preventing
revenue
leakage

Obligations
extraction
from
contracts

Proxy data,
hackathon
entry

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



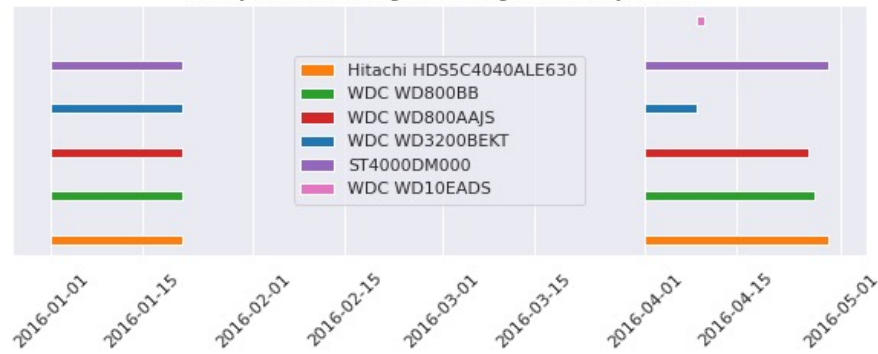
Azure
helpdesk
chatbot:

Employee
experience

Time to roll
out

Edge device failure prediction

Patchy event recordings, for a single device, by model

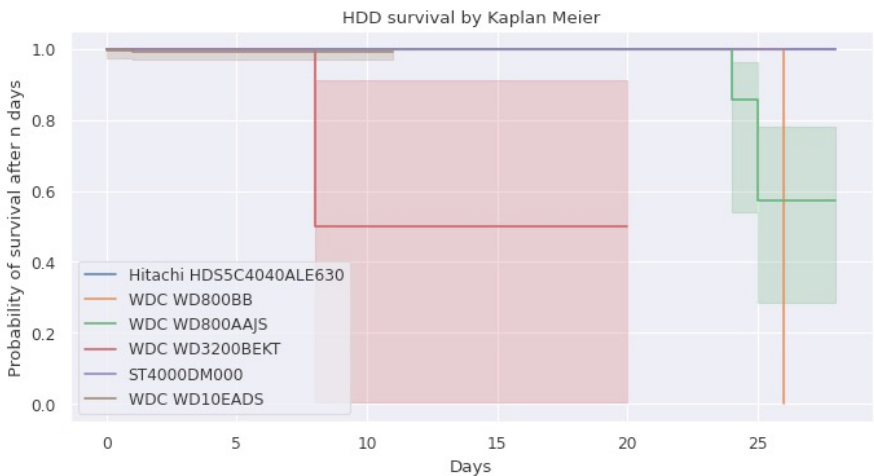


These are the failures for model WDC WD3200BEKT:

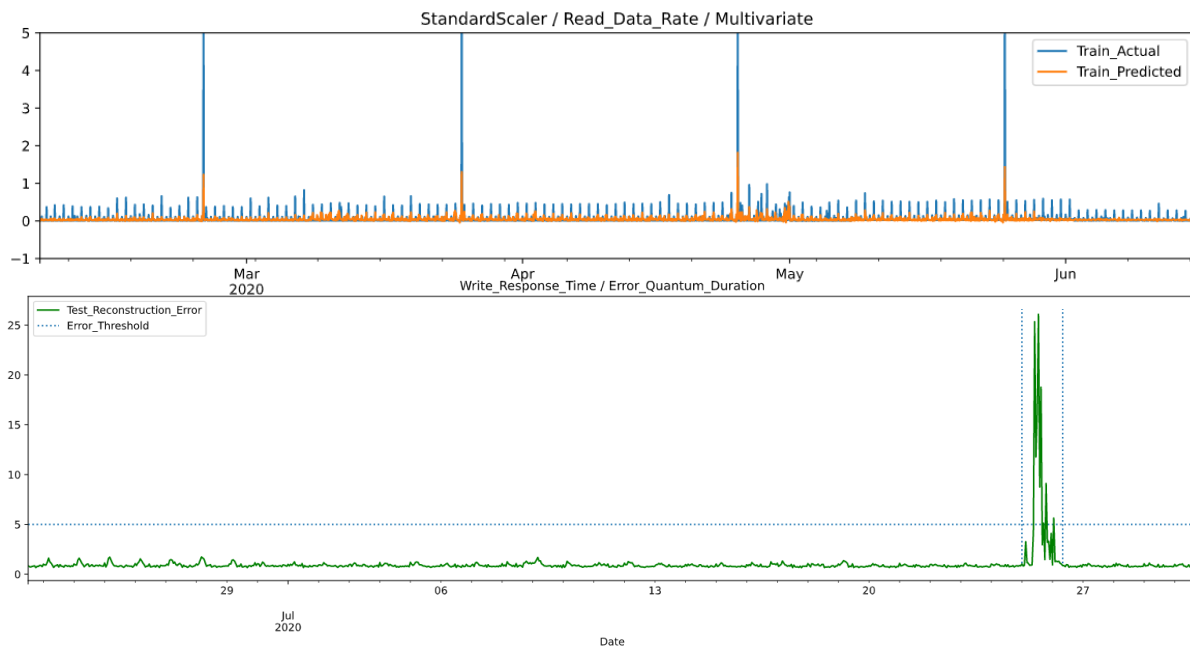
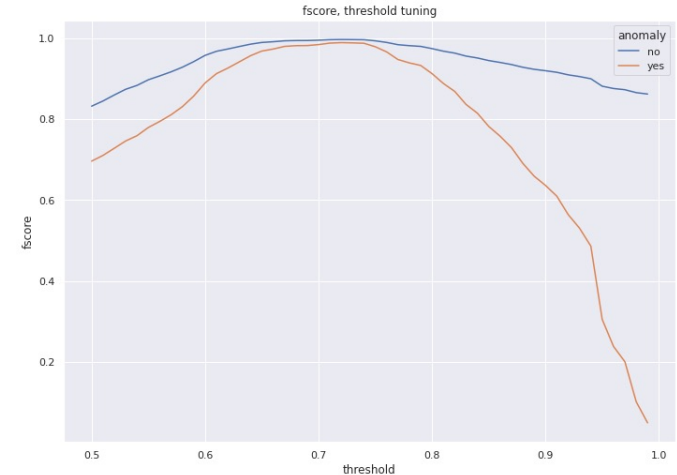
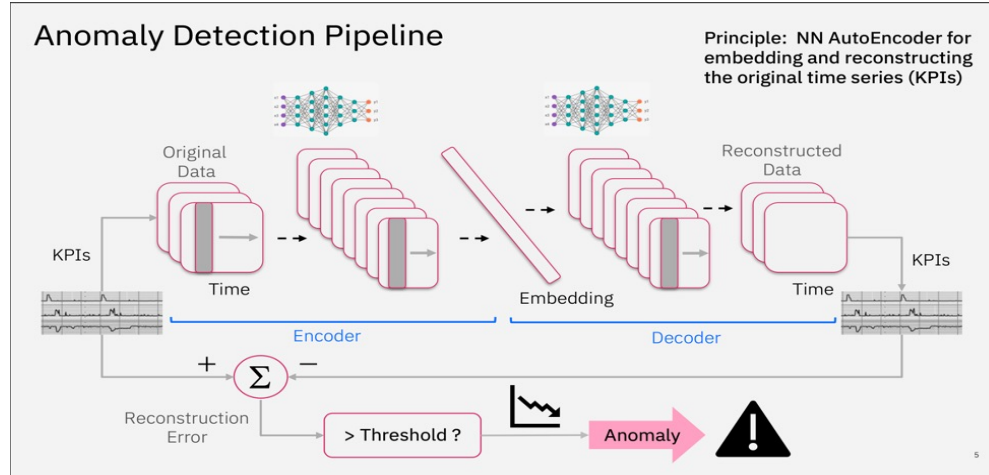
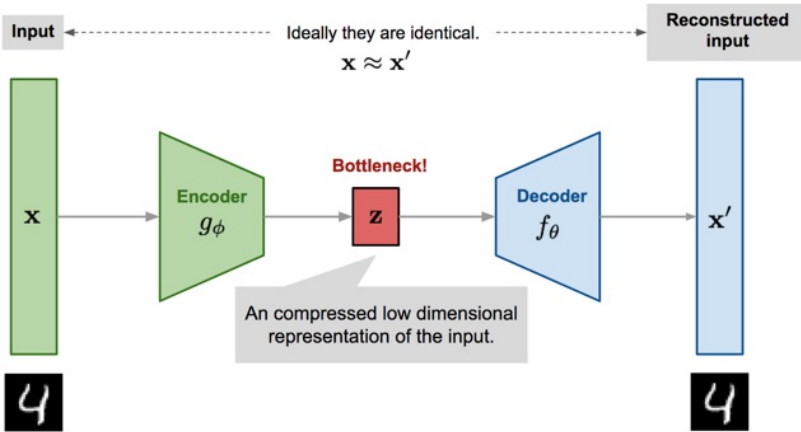
	removed	observed	censored	entrance	at_risk
event_at					
0.0	0	0	0	2	2
8.0	1	1	0	0	2
20.0	1	0	1	0	1

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

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	$\{(2-0)/2\} \times \{(2-1)/2\} \times \{(1-0)/1\} = 0.5$



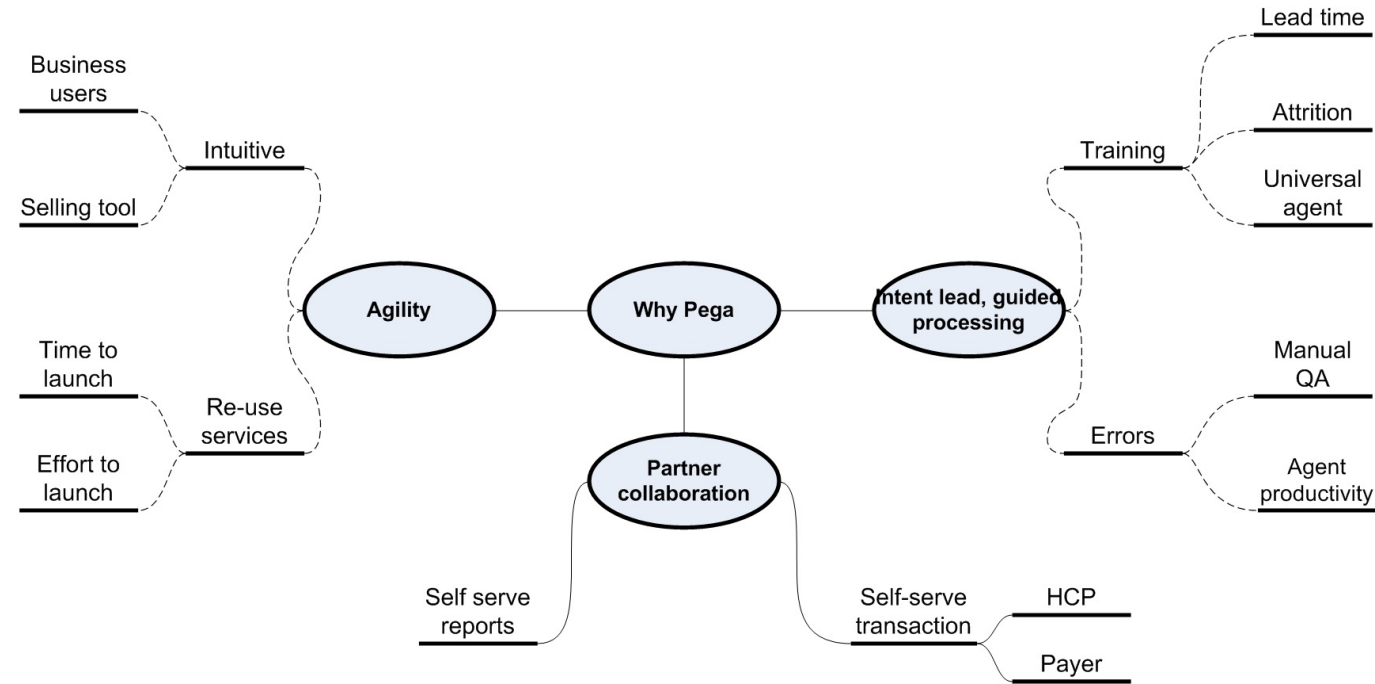
t_0	-1			
null_distribution	chi squared			
degrees_of_freedom	1			
test_name	logrank_test			
		test_statistic	p	-log2(p)
Hitachi HDS5C4040ALE630	ST4000DM000	5.41	0.02	5.64
	WDC WD10EADS	18.72	<0.005	16.01
	WDC WD3200BEKT	751.37	<0.005	547.10
	WDC WD800AAJS	799.60	<0.005	581.94
	WDC WD800BB	262.02	<0.005	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



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		

Securing edge devices (T-CNN Auto Encoder), anomaly detection

Pharma market access



Intent lead guided processing

- 1.Training: Strongly emphasized pain point
 - 1.Lead time for deploying a new hire (6 to 8 wks): Less to memorize/ "know". Shorter time to productivity.
 - 2.Attrition (50%): Trainees unable to cope with system complexity. Eliminate complexity, improve retention.
 - 3.Universal agent (currently program specific): Common process + system guidance = enhance agent mobility across programs = Easy scalability.
- 2.Errors: Prevent through advanced validations, helpful search + scripts + links to sources + personalized tips
 - 1.100% manual QA, 50:350 overheads: Eliminate waste.
 - 2.Agent productivity: Enables "first time right"... prevent going three screens in to discover an earlier error and having to back out

Agility

- 1.Re-use services: Launch same service for new customer with more configuration than coding
 - 1.Time to launch: 16 wks - slash
 - 2.Effort to launch: \$ 1Mn - slash
- 2.Intuitive
 - 1.Business user editable: Stated requirement. Provided with production class controls.
 - 2.Selling tool: Enables client sales team to make customized pitches to prospects

Partner collaboration

- 1.Reports: Secure access to live reports that provide deep insight. <Ad hoc reports?>
- 2.Transactions:
 - 1.HCP: Access the same process as the call center agents
 - 2.Payer: Secure token (DWA) to complete "zero touch process" (potentially)