

Deep Learning for Industries

About me



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Author of

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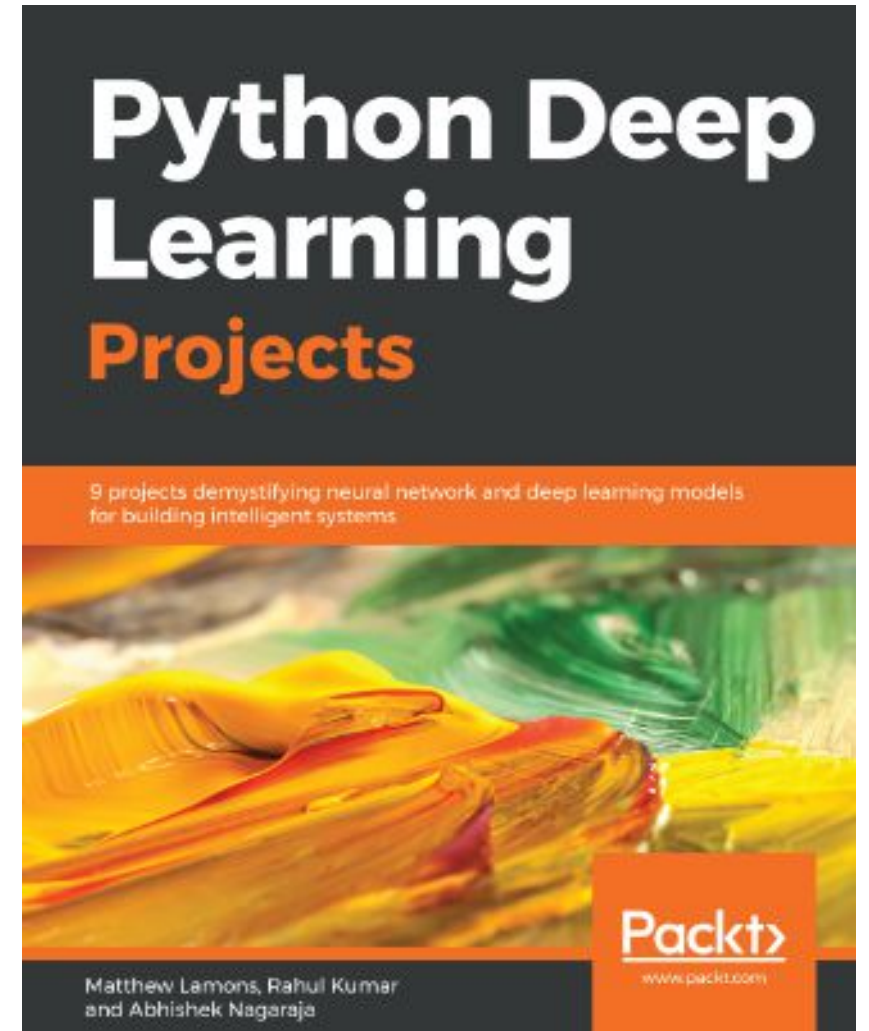
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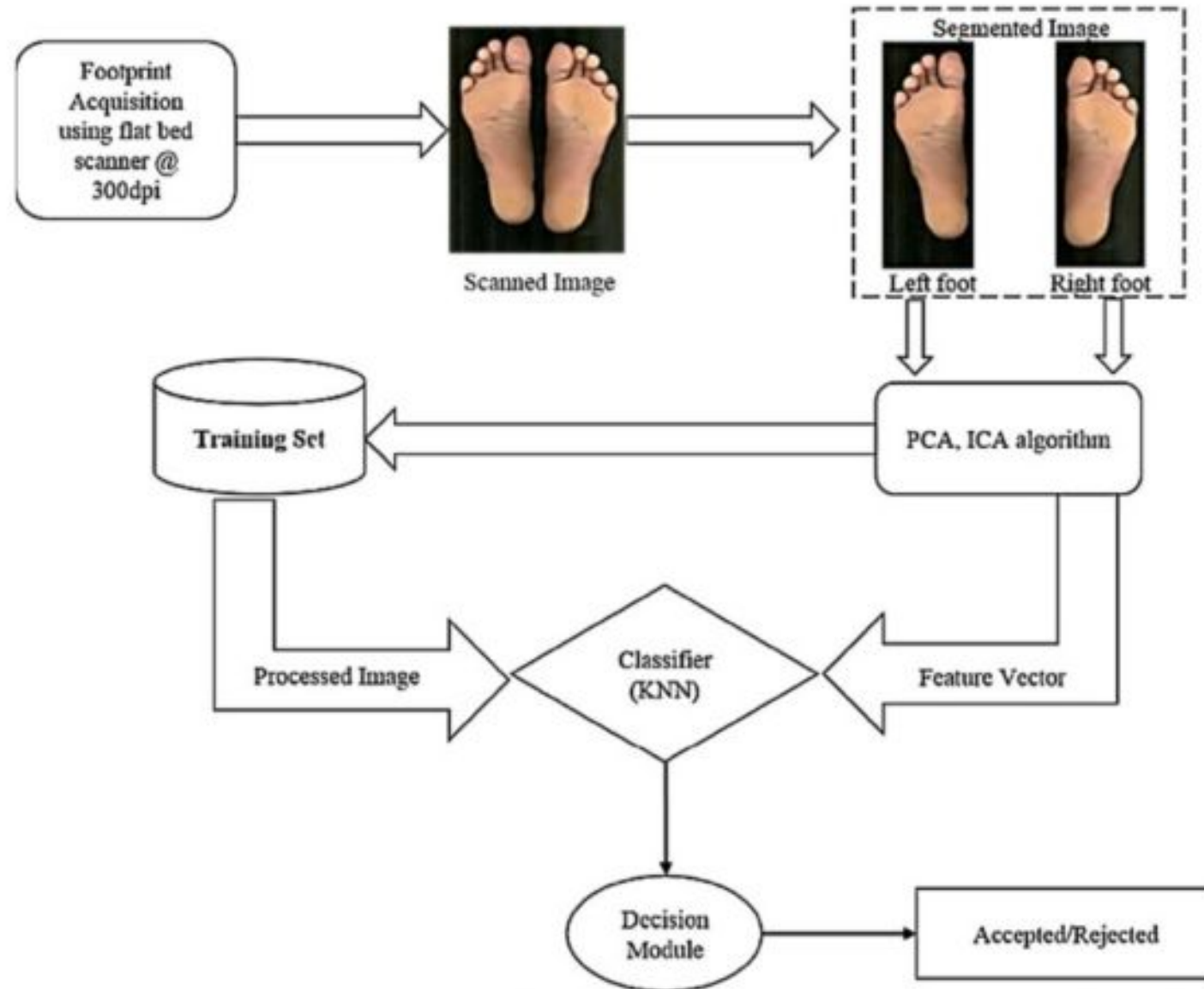
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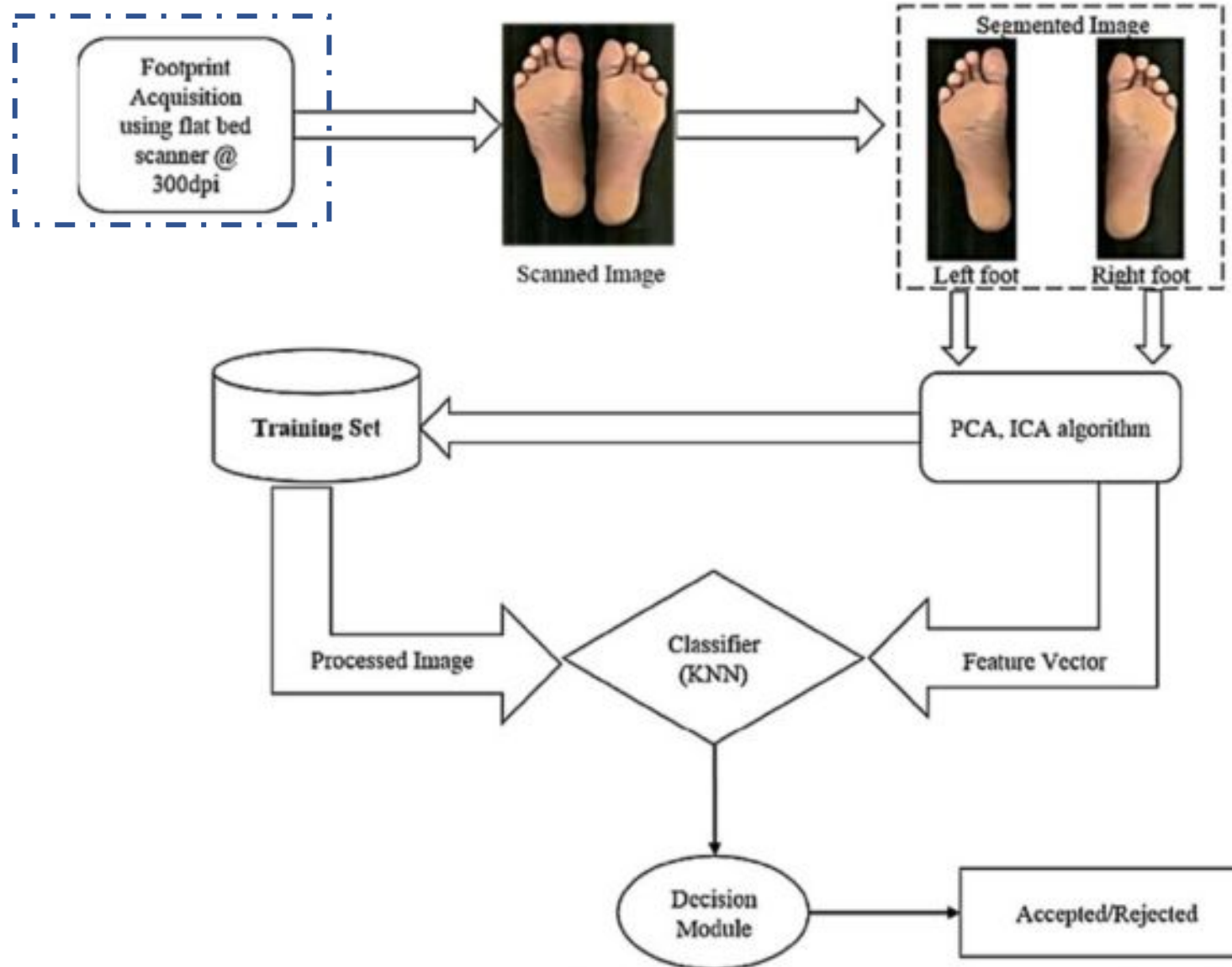
Researcher's Journey

Research Pipeline



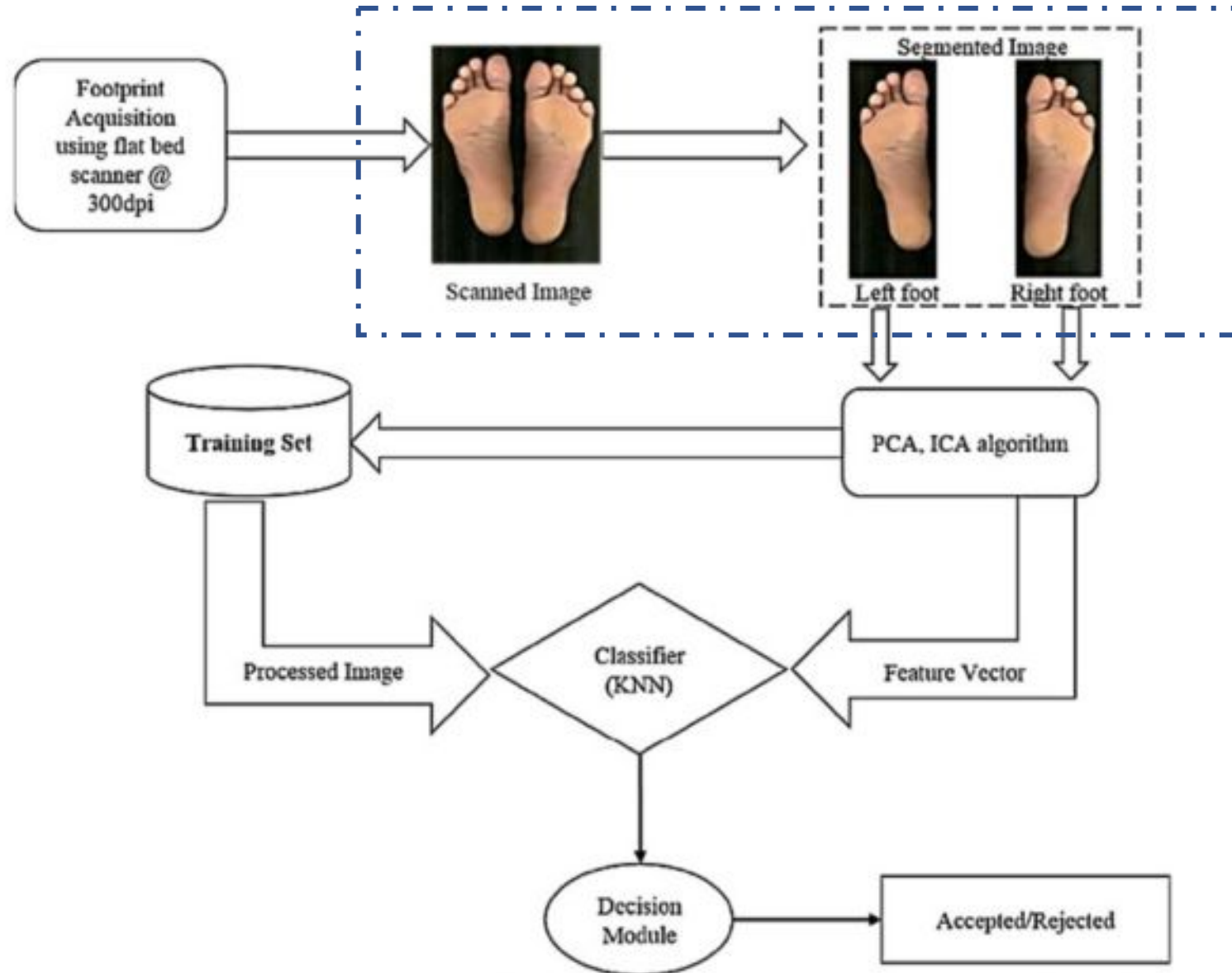
Research Pipeline

Data Acquisition



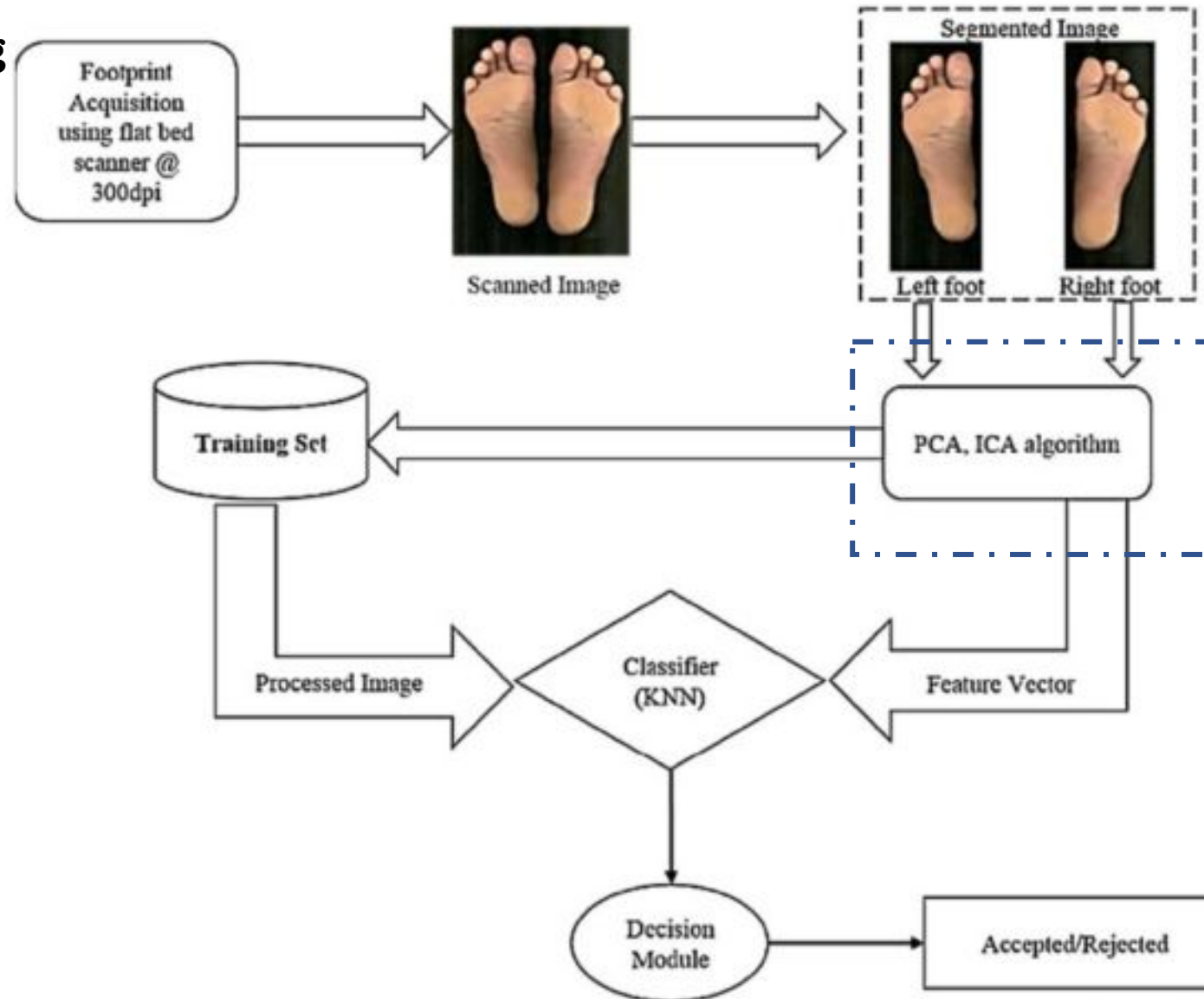
Research Pipeline

Pre-Processing



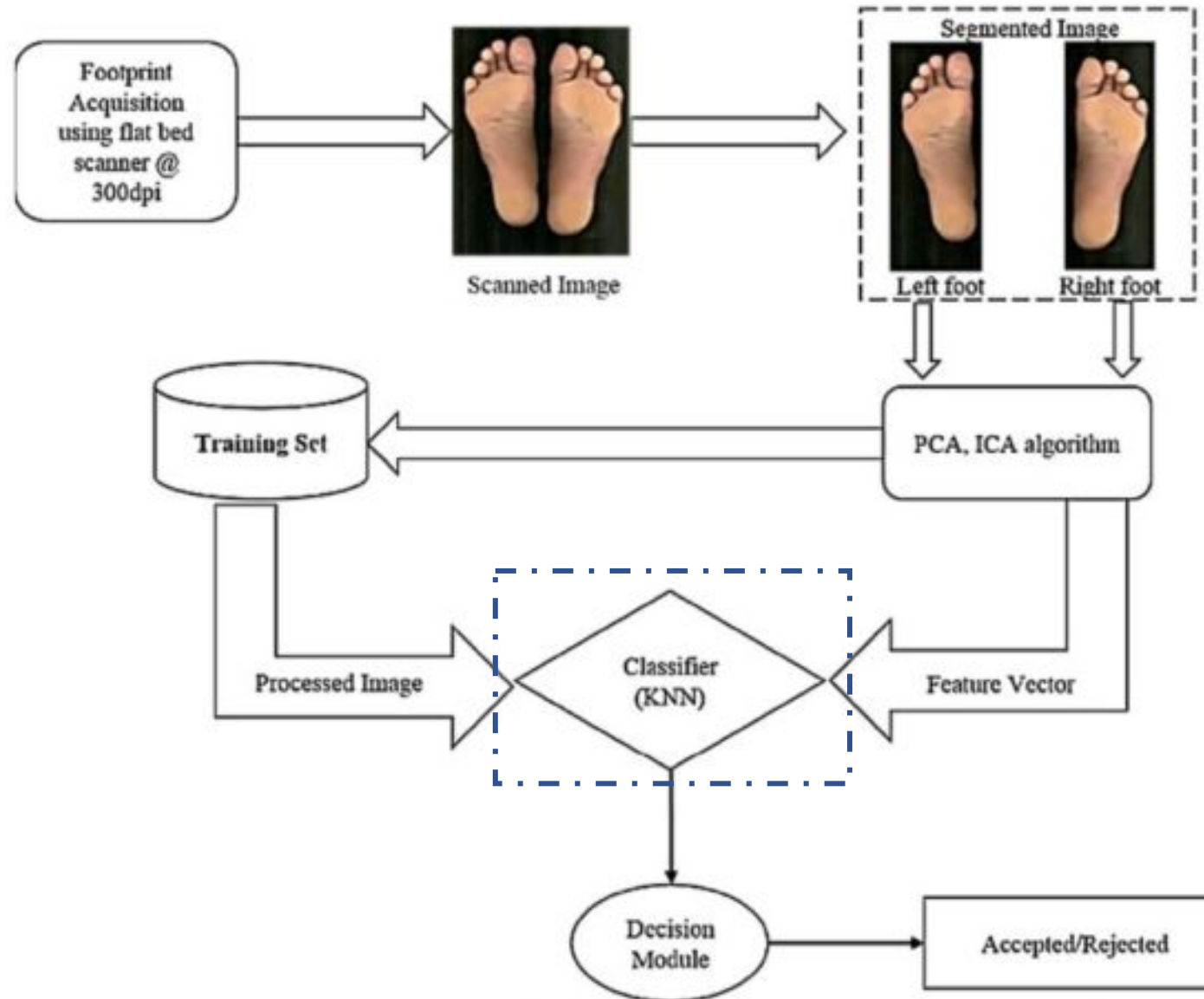
Research Pipeline

Feature Engineering



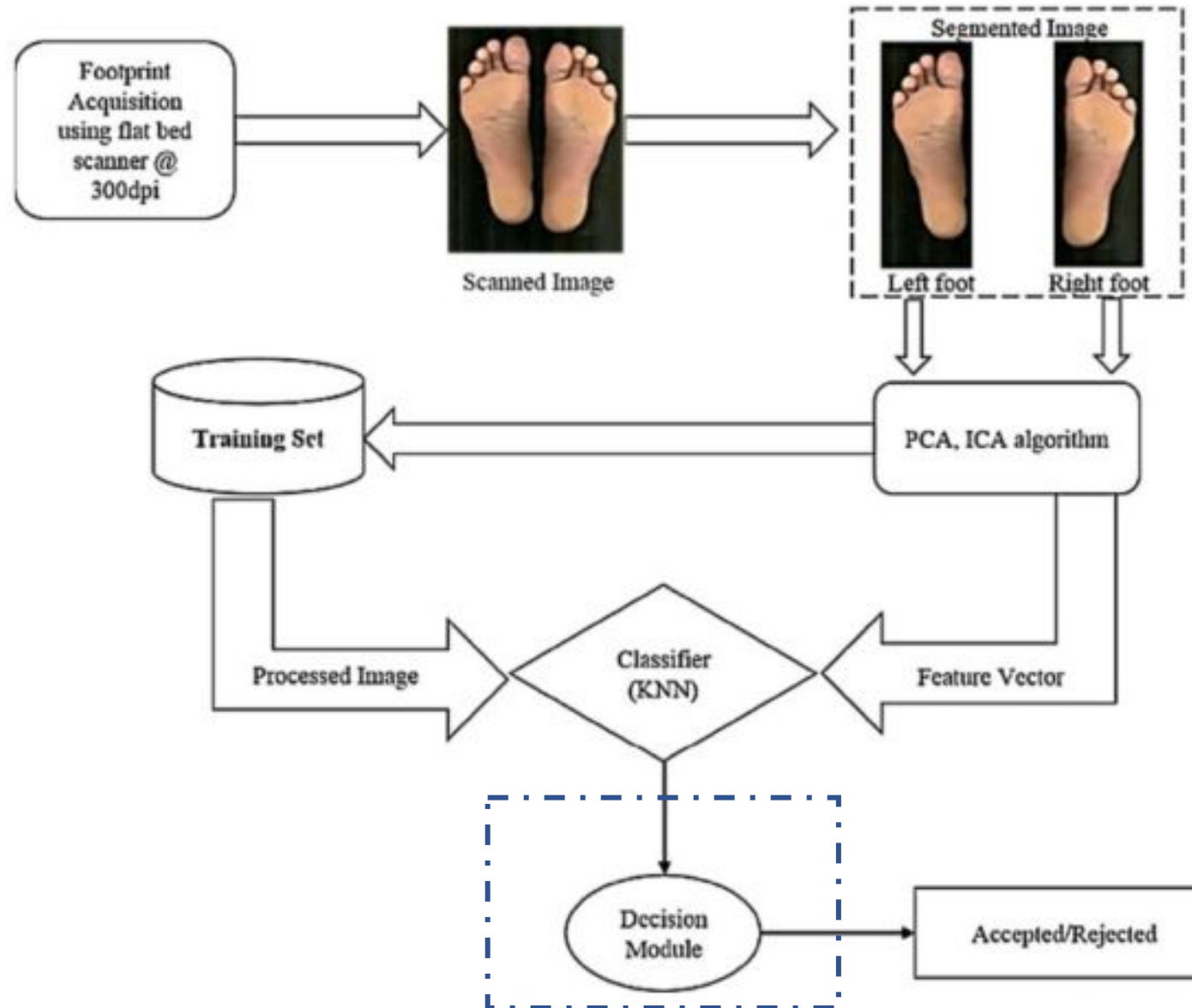
Research Pipeline

Training



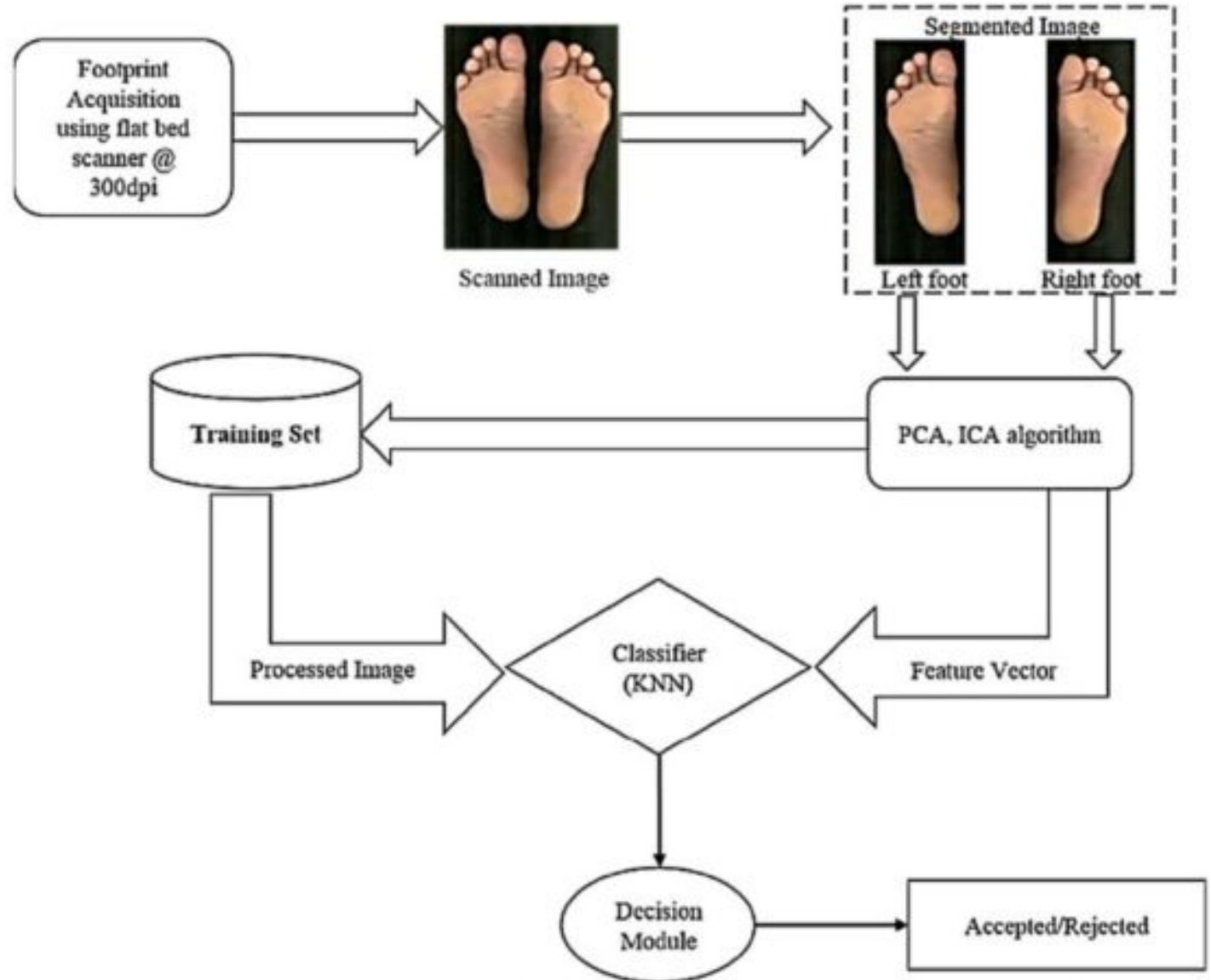
Research Pipeline

Evaluation



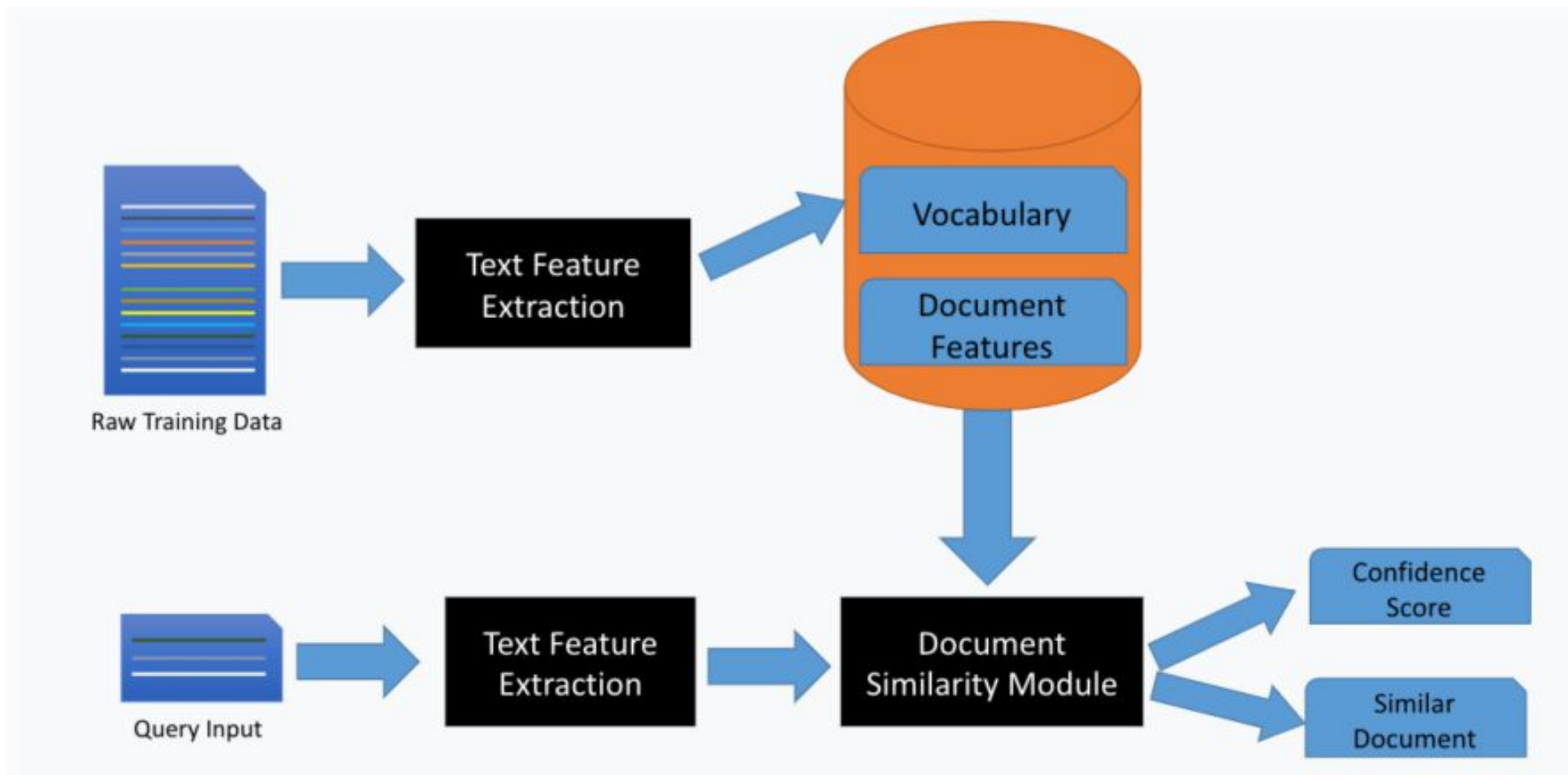
Research Pipeline **Caveats**

- Scalability issue
- Not reproducible
- Difficult to generalize
- Repetitive activities
- ...



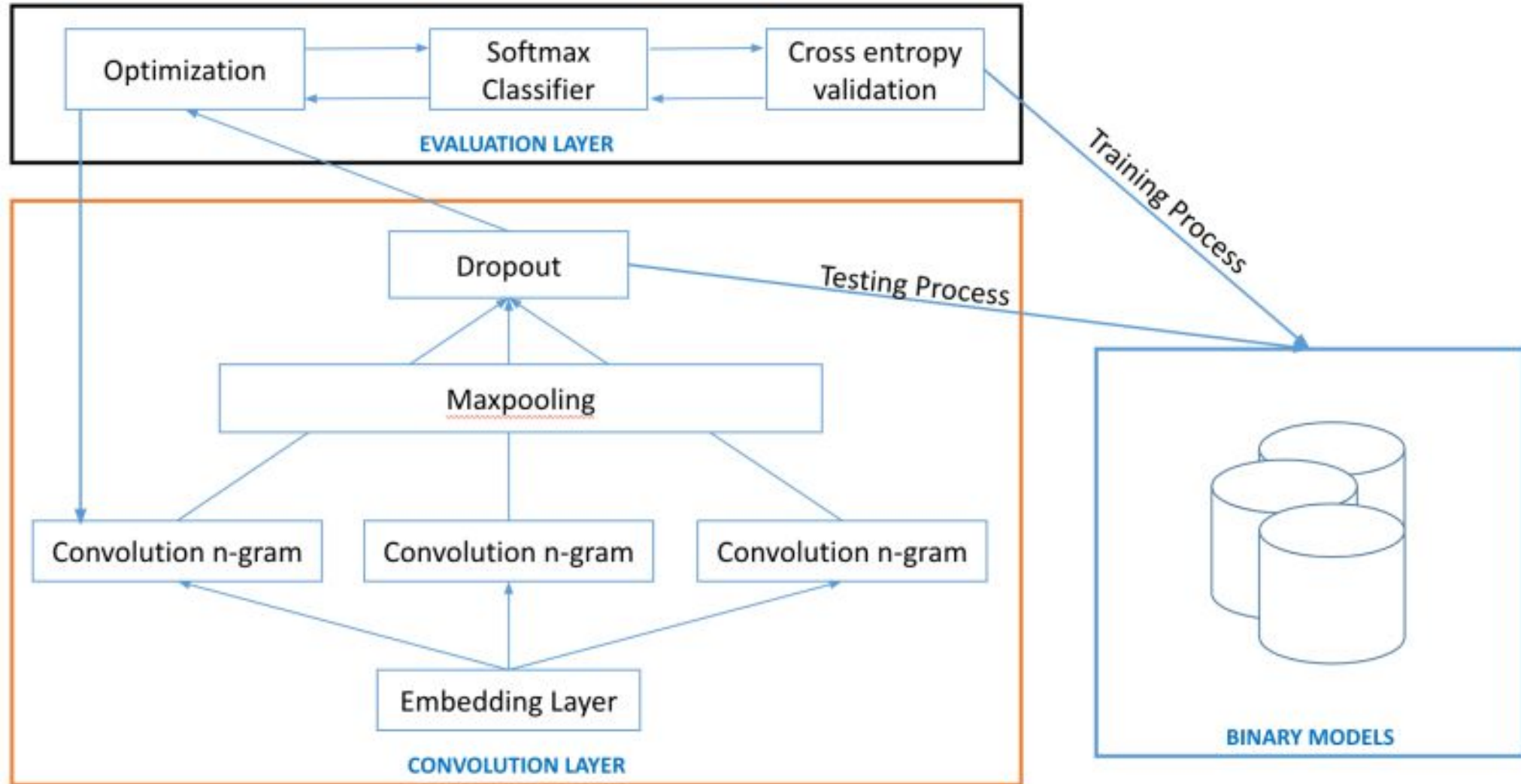
Production Journey

Research to Production



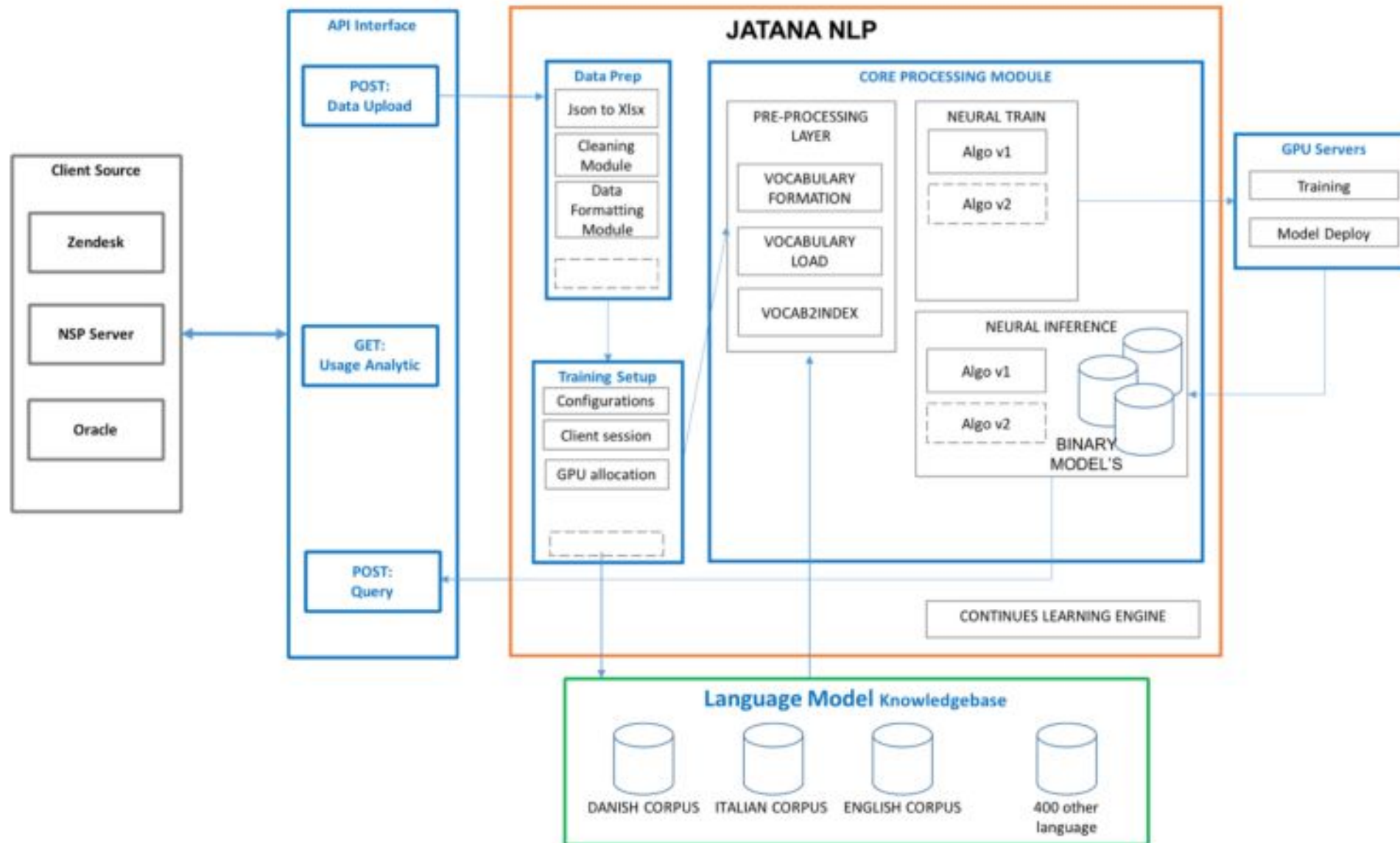
Iteration 1 : **2016**

Research to Production



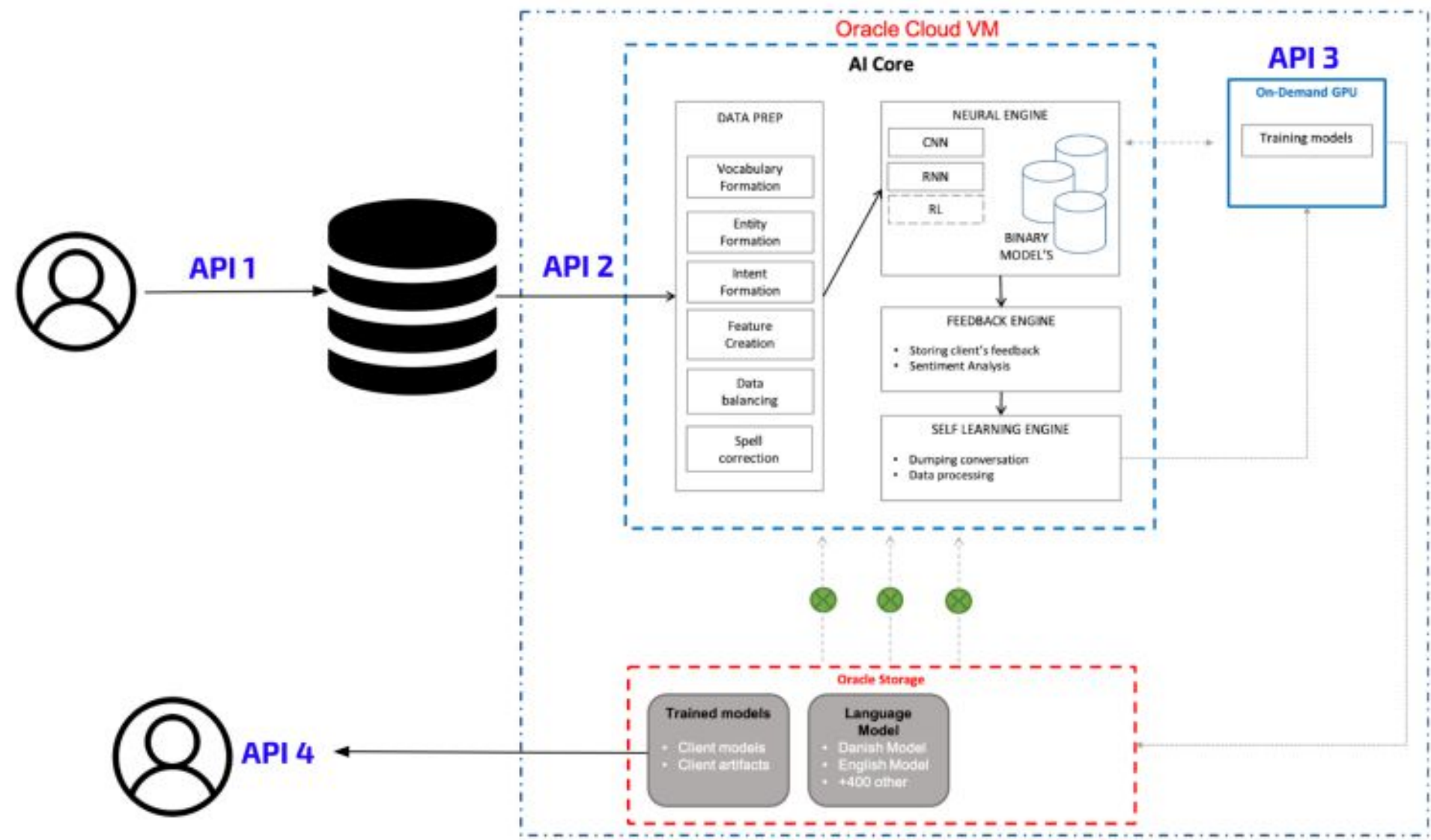
Iteration 2 : **2017**

Research to Production



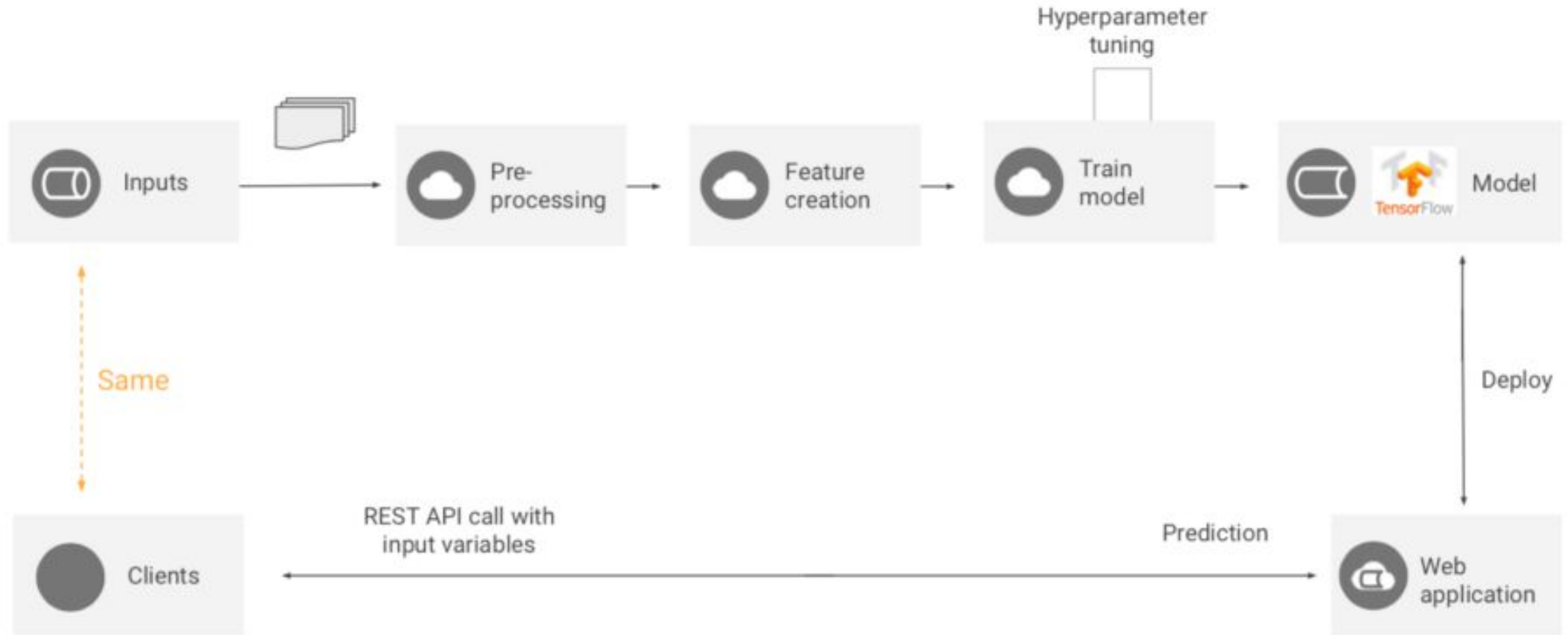
Iteration 3 : **2018**

Research to Production

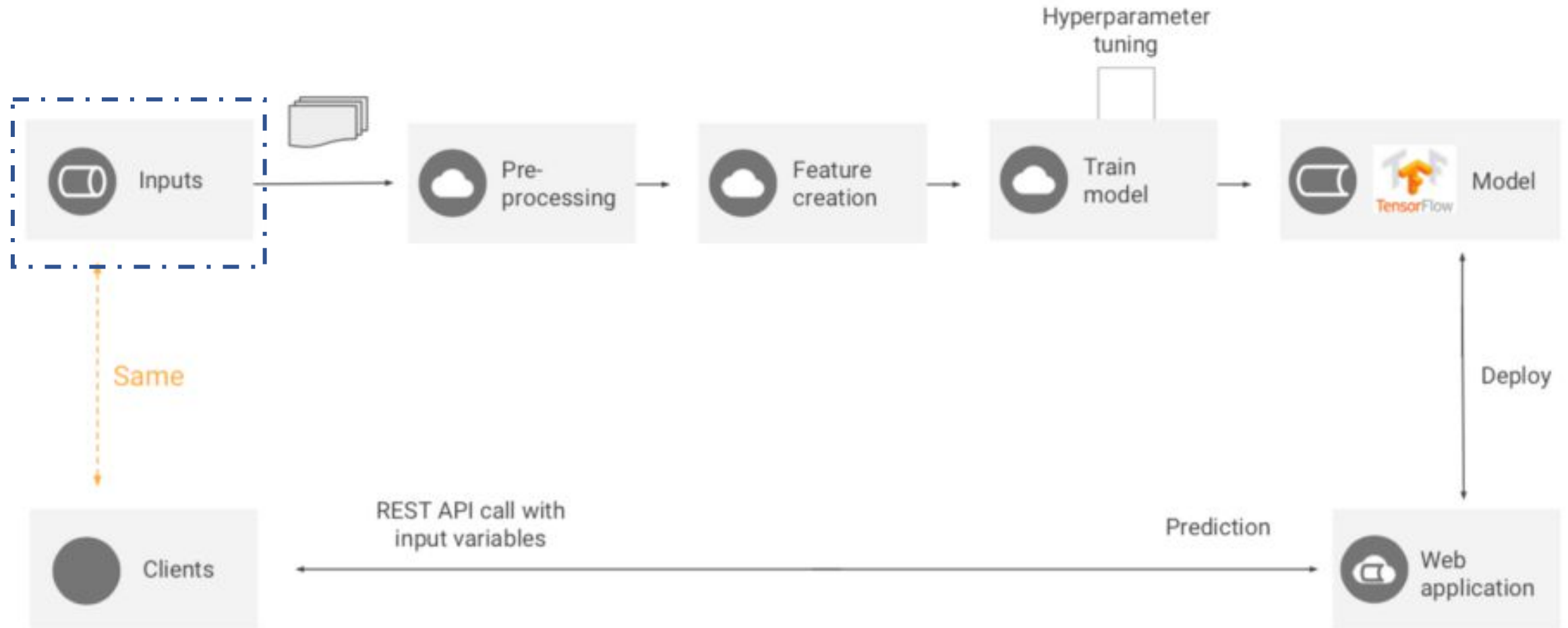


Iteration 4 : **2019**

Production Ready - End to End Pipeline



End to End Pipeline



End to End Pipeline : **INPUTS**

Data sources:

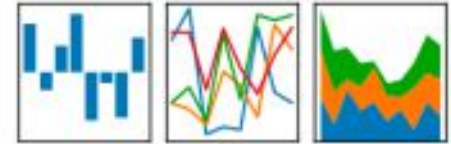
- Cameras
- CSV/ Excels
- Big data
- SQL databases
- Mongo DB

Key takeaway:

- Learn to build connectors
- Avoid I/O ops
- Use binary like pickles

pandas

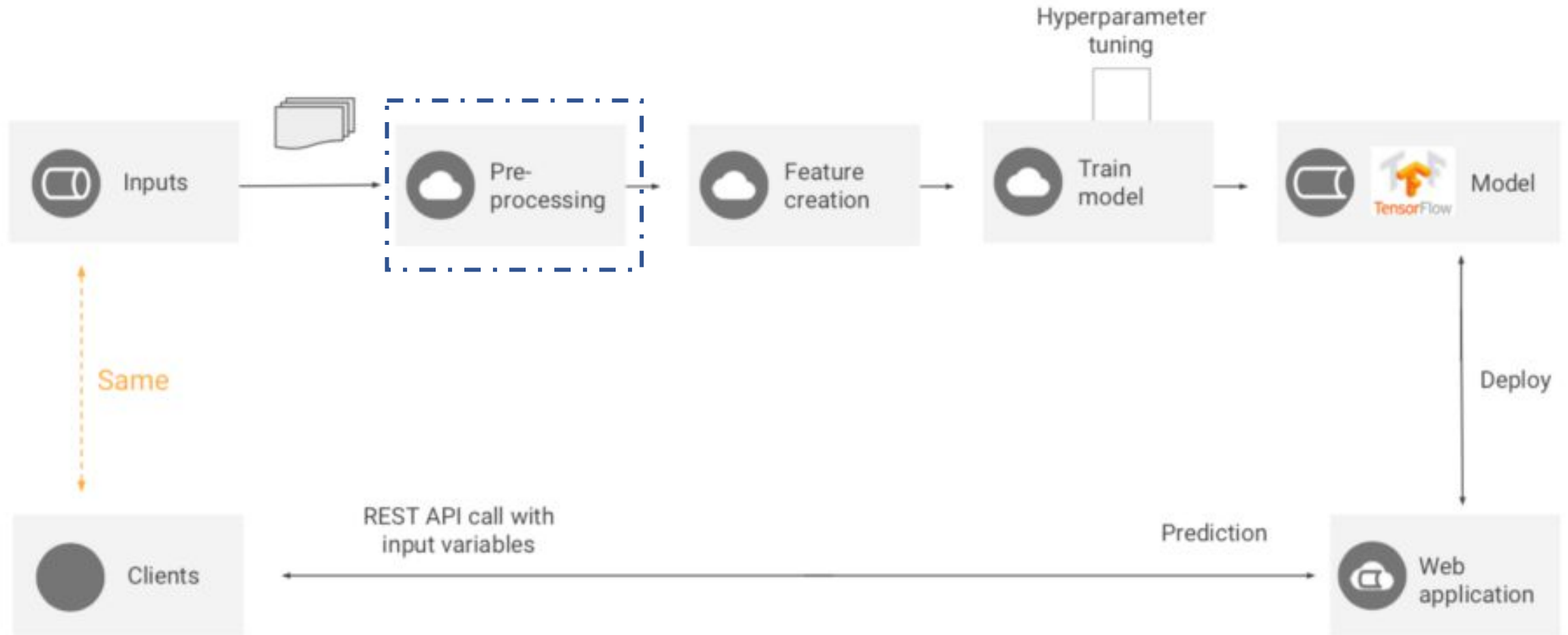
$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Google BigQuery



End to End Pipeline



End to End Pipeline : **PRE-PROCESSING**

Why do I care ?

In meteorology, precipitation is any product of the condensation of atmospheric water vapor that falls under **gravity**. The main forms of precipitation include drizzle, rain, sleet, snow, **grau-pel** and hail... Precipitation forms as smaller droplets coalesce via collision with other rain drops or ice crystals **within a cloud**. Short, intense periods of rain in scattered locations are called "showers".

What causes precipitation to fall?

gravity

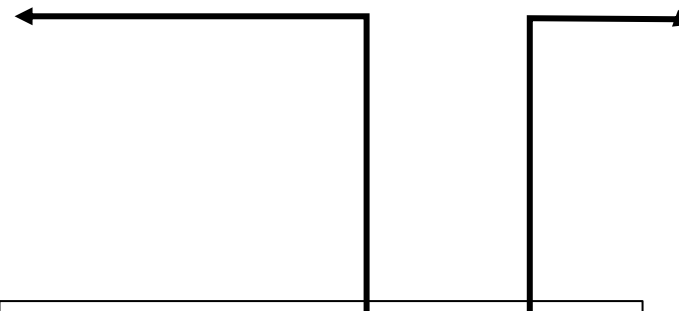
What is another main form of precipitation besides drizzle, rain, snow, sleet and hail?

grau-pel

Where do water droplets collide with ice crystals to form precipitation?

within a cloud

Figure 1: Question-answer pairs for a sample passage in the SQuAD dataset. Each of the answers is a segment of text from the passage.



	SQuAD 1.1	SQuAD 2.0
Train		
Total examples	87,599	130,319
Negative examples	0	43,498
Total articles	442	442
Articles with negatives	0	285
Development		
Total examples	10,570	11,873
Negative examples	0	5,945
Total articles	48	35
Articles with negatives	0	35
Test		
Total examples	9,533	8,862
Negative examples	0	4,332
Total articles	46	28
Articles with negatives	0	28

Table 2: Dataset statistics of SQuAD 2.0, compared to the previous SQuAD 1.1.

Article: Endangered Species Act

Paragraph: "... Other legislation followed, including the Migratory Bird Conservation Act of 1929, a **1937 treaty** prohibiting the hunting of right and gray whales, and the **Bald Eagle Protection Act of 1940**. These **later laws** had a low cost to society—the species were relatively rare—and little **opposition** was raised."

Question 1: "Which laws faced significant **opposition**?"

Plausible Answer: **later laws**

Question 2: "What was the name of the **1937 treaty**?"

Plausible Answer: **Bald Eagle Protection Act**

Figure 1: Two unanswerable questions written by crowdworkers, along with plausible (but incorrect) answers. Relevant keywords are shown in blue.

End to End Pipeline : **PRE-PROCESSING**

But ...

0	Jag skulle vilja avbryta min order 686853 om de går! __label__51544721	Avbeställning::Order skickad
1	Köpte en Vitamix i dec 2017. Den fungerar nu inte. Hur kan ni hjälpa mig med det? __label__52894621	Reklamation::Defekt vara - Steg 1 - Bildbevis
2	jeg h ar fornylig handlet hos jer, hvor jeg undlod at krydse af, at jeg ville modtage nyhedsbrev. Alligevel får jeg disse fra jer.	Övrigt::Avregistrering nyhetsbrev
3	Hej	Kontakta kund::Utgått - En artikel beställd
4	Hejsan, fick precis min vara och har fått helt fel!!!__label__53839291	Reklamation::Felplock - Steg 1
5	Placering: Inlagrad Artikelnr/Vendor: 28714947Gammalt EAN Saknas	EAN matchar inte i EMMS/Zion
6	Hej, Vi har behandlat en beställning **672668** från dig och skickade ut ditt paket. Det utskickade pakete...	Returhantering::Ej uthämtad försändelse - Ordervärde över 199 kr
7	Placering: Inlagrad Artikelnr/Vendor: 28397868Gammalt EAN Saknas	EAN matchar inte i EMMS/Zion
8	avbeställning av skyddshuv 125 x 183 x 54 ordnr 671881 Lennart Andersson Händelövägen 46 60385 Norrköping__label__51555641	Avbeställning::Avbeställning
9	Hej, Vi har behandlat en beställning **603357** från dig och skickade ut ditt paket. Det utskickade pakete...	Returhantering::Ej uthämtad försändelse - Ordervärde under 199 kr
10	Hej Lotta! Vi har nu mottagit och godkänt din retur **621669**.	Returhantering::Retur - Mottagen och godkänd
11	Hej! Vi har nu mottagit och godkänt din retur **673389**.	Returhantering::Retur - Mottagen och godkänd
12	Hej! Jag har gjort en anmälan om retur på tre tallrikar Gerbera. Tallrikar var för stora att äta på, lite	Returhantering::Skicka ut returfraktsedel
13	Hej Tina! Vi har nu mottaget og godkendt din retur **671887**.	DK::Returhantering::Retur - Mottagen och godkänd
14	Hej Steen! Vi har nu mottaget og godkendt din retur **664888**.	DK::Returhantering::Retur - Mottagen och godkänd
15	Hej Jens! Vi har nu mottaget og godkendt din retur **658542**.	DK::Returhantering::Retur - Mottagen och godkänd
16	Hej! Vi har nu mottaget og godkendt din retur **668884**.	DK::Returhantering::Retur - Mottagen och godkänd
17	Hej! Vi har nu mottaget og godkendt din retur **659291**.	DK::Returhantering::Retur - Mottagen och godkänd
18	Hej Helle! Vi har nu mottaget og godkendt din retur **674675**.	DK::Returhantering::Retur - Mottagen och godkänd

End to End Pipeline : **PRE-PROCESSING**

0	Merhabalar Pro yazılım ve eğitimi satın aldım amazon satış hesabımı açtım herşey tamam fakat	Yazılım Support
1	Merhaba. Pro yazılıma kaya.online hesabım ile giriş yapmak istediğimde E-posta adresiniz	Yazılım Support
2	PRO yazılıma giriş yapmak istediğimde, "E-posta adresiniz veya Sifreniz hatalı!" uyarısı alıyorum.__label__360016994153	Yazılım Support
3	Merhaba ismim Caner Saltık dün tarafınızdan gelen sözleşmeyi imzaladım ve 20 dolarlık ödemeyi yaptım, şimdi ne yapmam gerekiyor hesabımı nasıl başlayacağım Ekim..	Stripe Bağlantı Adımları-
4	merhabalar, amazon fba eğitimi hangi eğitim setinizde acaba, bu yazılımlar ve diğer p..	Dropshipping içerik
5	Daha amazon hesabım kayıt aşamasında ama amazon hesabım ile kaya online hesap mail adresleri birbirinden farklı ondan dolayı mı giriş yapamıyorum? iyi çalışmalar__lab..	Yazılım Support
6	şubat ayında aldığım ve uzun süre kullandığım hesabım şifre hatası veriyor. lakin siteye şifrem ile giriş yapabiliyorum.	Tarayıcı Yeniden
7	Merhabalar pro yazılım linkini gönderirmisiniz??__label__360022588274	PRO
8	Merhaba,	Tarayıcı Yeniden
9	merhaba danışmanlık paketinin içeriği nedir acaba bilgi alabilirmiyim ?__label__360010317053	Danışmanlık linki
10	Bir ayrıcalık gösterseniz olmazmı Ekim Kaya bey o eğitimi ben almak istemiyorum lütfen rica ediyorum iade alın ödeyecek gücüm yok siz onu başka bir arkadaşına satars..	İade Metni
11	İyi günler, bu konu/olay hakkında bilgi almak istiyorum. 0543 926 0640 telefon numaram, dönüş sağlarsanız çok sevinirim__label__360023919753	Dropshipping içerik
12	Merhabalar! Dropshipping eğitim satın aldım. 1- Pexda'ya üye olmak istiyorum.	Pexda Abonelik Linki
13	Merhabalar! Dropshipping eğitim satın aldım. 1- Pexda'ya üye olmak istiyorum.	Stripe Bilgi
14	Merhabalar Ben Kurs Almak İstiyorum Fakat Yaşım 16 Henüz Bir Kredi Kartım Yok Acaba Kayıt Olabilir miyim böyle birşey mümkün mü ? İninal - paypal kart vs ön ödemeli ka..	+18
15	Ekim Nazim Kaya Founding Partner Botego Inc.	Stripe Bilgi
16	Normal versiyonu alıp daha sonra 100 dolar farkla pro sürüme yükseltebilir miyiz__label__360028305034	Extenship Satın Al
17	Merhaba Geçen ay kurs satın aldım ancak daha satışa başlamadım.Ekim beyin bir videosunda	İade Metni
18	Ekim Bey Merhaba ; Nasılsınız ,	zohho

0	0	Hej!_x000D_ _x000D_ Jag skickade en mejlförfrågan för några veckor sedan men kanske kom mejlet på villovägar så jag tänkte att det var b...	65722231
0	1	Detta är en uppföljning till din föregående förfrågan #324737 "Din reklamation hos Kitchen..." Hej har ni inte mottagit min retur ännu?...	51638752
1	2	Hej!_x000D_ Önskar avsluta mejlreklam från er. _x000D_ Mvh Lena Eriksson	153171465
2	3	Hej! Hämtade hem nedanstående lev idag 29/3_x000D_ När vi packade upp våffeljärnet är det totalt sönder på insidans ovansida. Se bif foto. Y...	54353902
3	4	Hej! Jag har väntat väldigt länge nu på min order som verkar vara i lager om man kollar er hemisda! Om ni inte skickar den snart måste jag...	51555641
4	5	Hei! Hvor blir det av min bestilling med ordrenummer: 625596 ? Det har gått snart to måneder siden jeg bestilte den 10. Mars. For dårlig...	53375672
5	6	Placering: Karantän manuella Inköpsnummer: Saknas (Saknas inköpsnummer-Bifoga information som kommit med leveransen alternativt ett urval art...	360000722429
6	7	Jag har inte fått nån faktura till min order/ äggkokaren!_x000D_ Mvh/ Maha Hannouneh	52777532
7	8	*** Call Info *** Caller Number: 0702178396 Caller Name: KitchenTime SE Leverans Call To: 0188008001 Queue: KitchenTime-SE UniqueId: 152568150...	52520151
8	9	Hej_x000D_ Jag har köpet hos er WV5 Premium Fönstertvätt - Kärcher vill nu reklmera att den laddar inte eftersom jag har 3årsgarntin så vill g...	88526025
9	10	Hej Joakim tack för ditt meddelande! Vi beklagar verkligen att produkten inte lever upp till dina förväntningar. Vi har tagit kontak...	53617522
10	11	Hej KitchenTime._x000D_ _x000D_ Vedr. ordre: 626851_x000D_ _x000D_ Jeg har i dag modtaget min ordre (4 glas). Der er desværre fejl i det ene ...	52894621
11	12	Founding Partner Botego Inc.	
12	13	Normal versiyonu alıp daha sonra 100 dolar farkla pro sürüme yükseltebilir miyiz_label_360028305034	Extenship Satın Al
13	14	Merhaba Geçen ay kurs satın aldım ancak daha satışa başlamadım.Ekim beyin bir videosunda	İade Metni
14	15	Ekim Bey Merhaba ; Nasılsınız ,	zohho
15	16	Merhaba Ekim Bey Merhaba ; Geçen ay kurs satın aldım ancak daha satışa başlamadım.Ekim beyin bir videosunda	



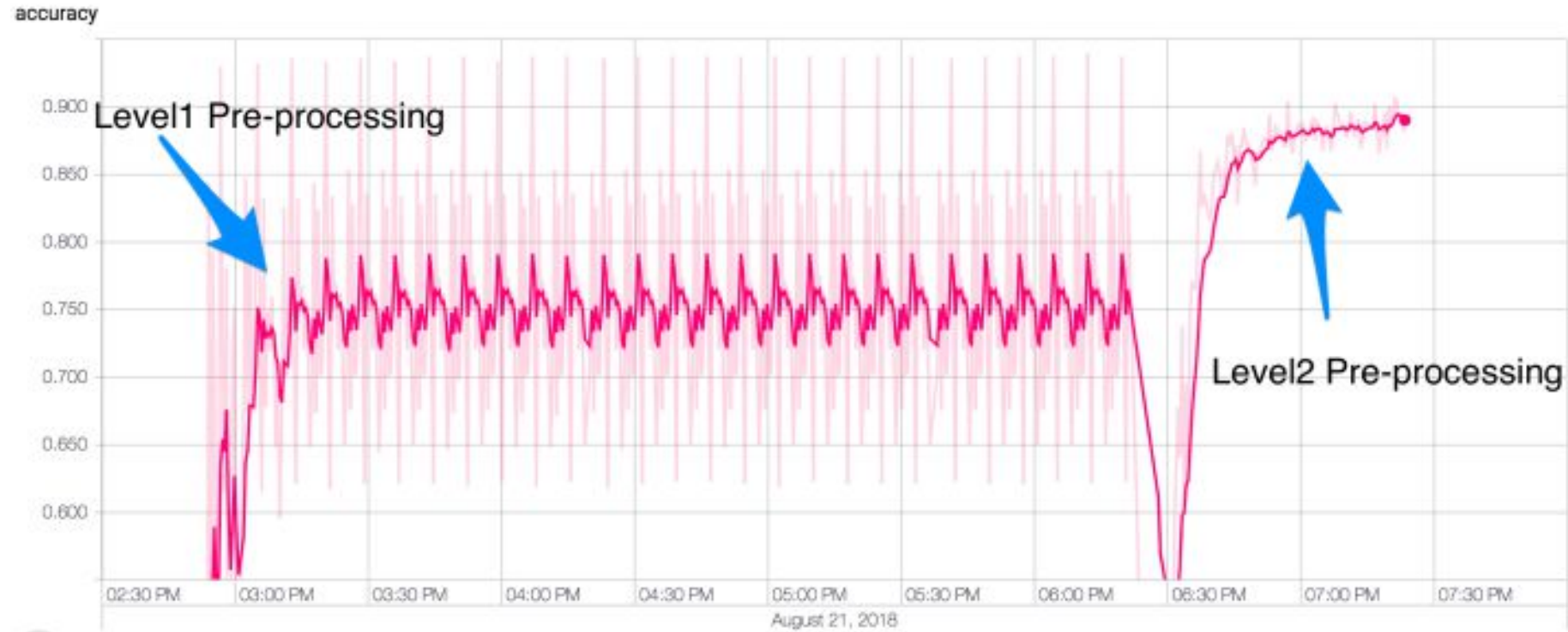
0	0	Hej!_x000D_ _x000D_ Jag skickade en mejlförfrågan för någon sedan men kanske kom mejlet på villovägar så jag tänkte
1	1	Detta är en uppföljning till din föregående förfrågning reklamation hos Kitchen..." Hej har ni inte
2	2	Hej!_x000D_ Önskar avsluta mejlreklam från Eriksson
3	3	Hej! Hämtade hem nedanstående lev
4	4	våffeljärnet är det totalt sönd
5	5	Hej! Jag har väntat väldigt
6	6	lager om man kollar er
7	7	Hei! Hvor blir de
8	8	har gått snart
9	9	Placering:
10	10	Bifoga
11	11	Jag
12	12	Caller Name: KitchenTime SE
13	13	KitchenTime-SE UniqueId: 152568150...
14	14	Premium Fönstertvätt - Kärcher vill
15	15	ertersom jag har 3årsgarntin så vill g...
16	16	meddelande! Vi beklagar verkligen att
17	17	till dina förväntningar. Vi har tagit kontak...
18	18	_x000D_ Vedr. ordre: 626851_x000D_ _x000D_ Jeg
19	19	min ordre (4 glas). Der er desværre fejl i det ene ...

100 dolar farkla pro sürüme yükseltebilir	Extenship Satın Al
atın aldım ancak daha satışa başlamadım.Ekim beyin bir videosunda	İade Metni
naba ;	zohho

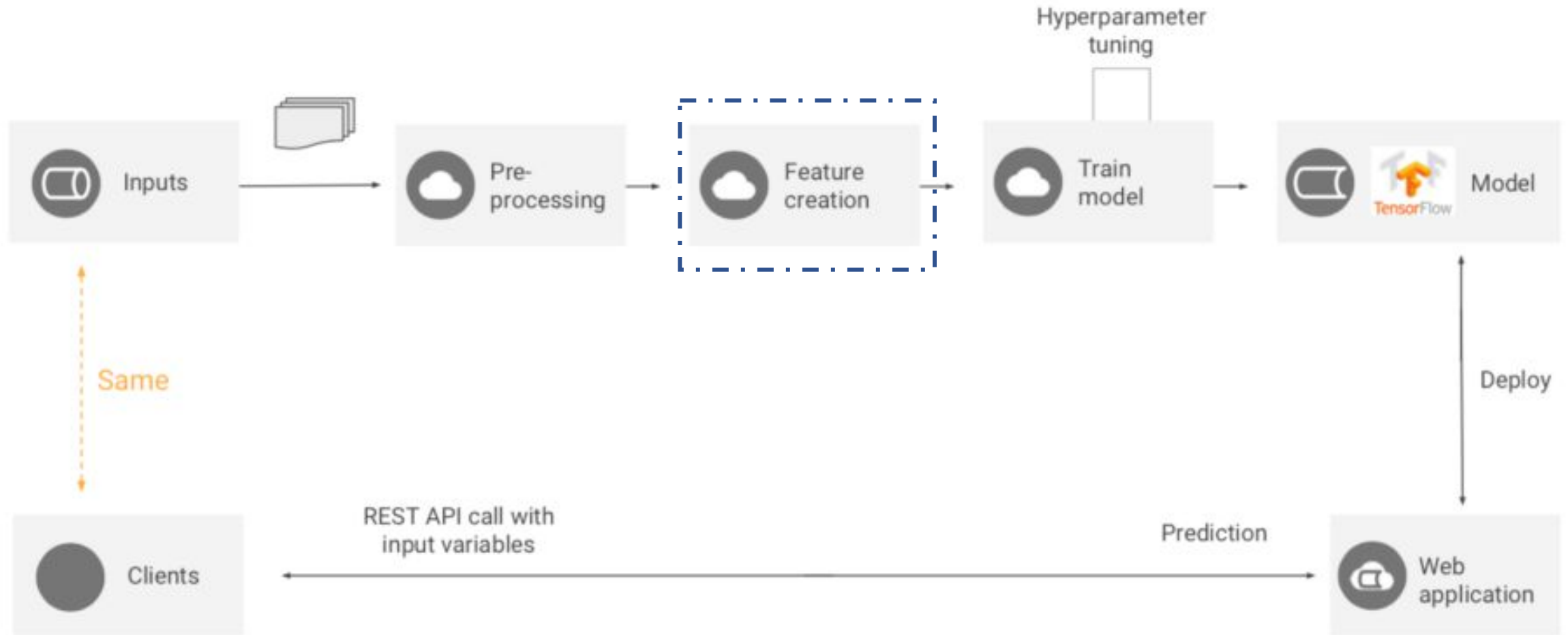
End to End Pipeline : **PRE-PROCESSING**

Key takeaway:

- Make it modular
- Version



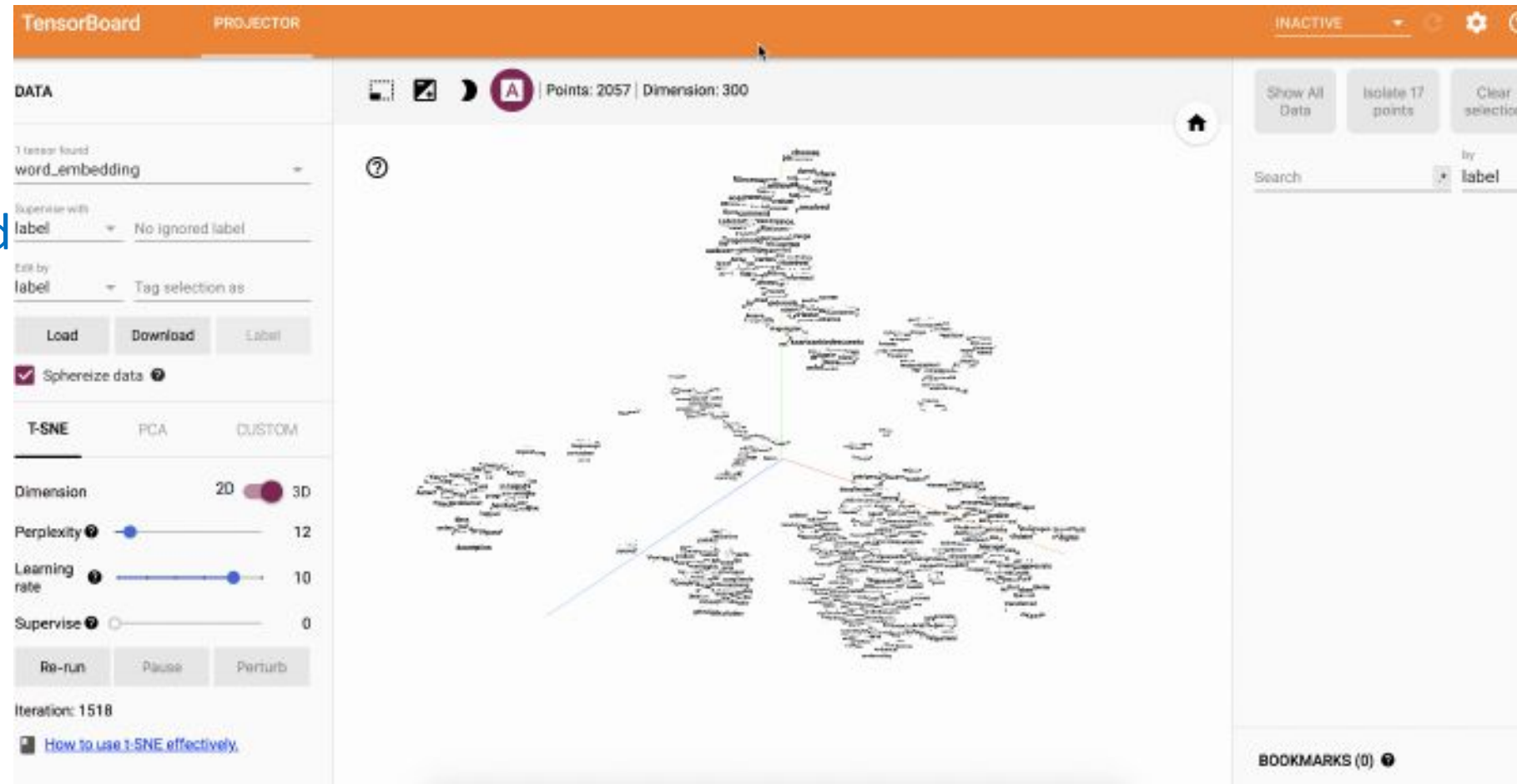
End to End Pipeline



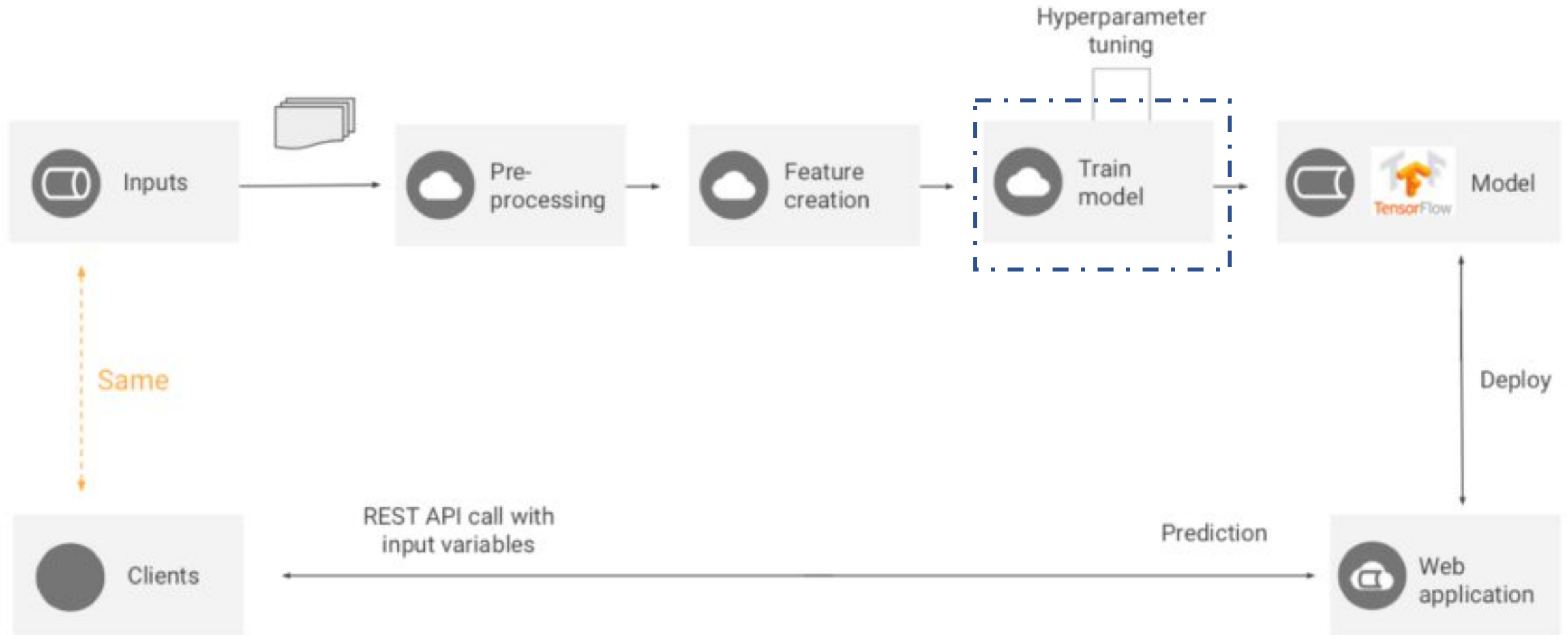
End to End Pipeline : **FEATURE CREATION**

Key takeaway:

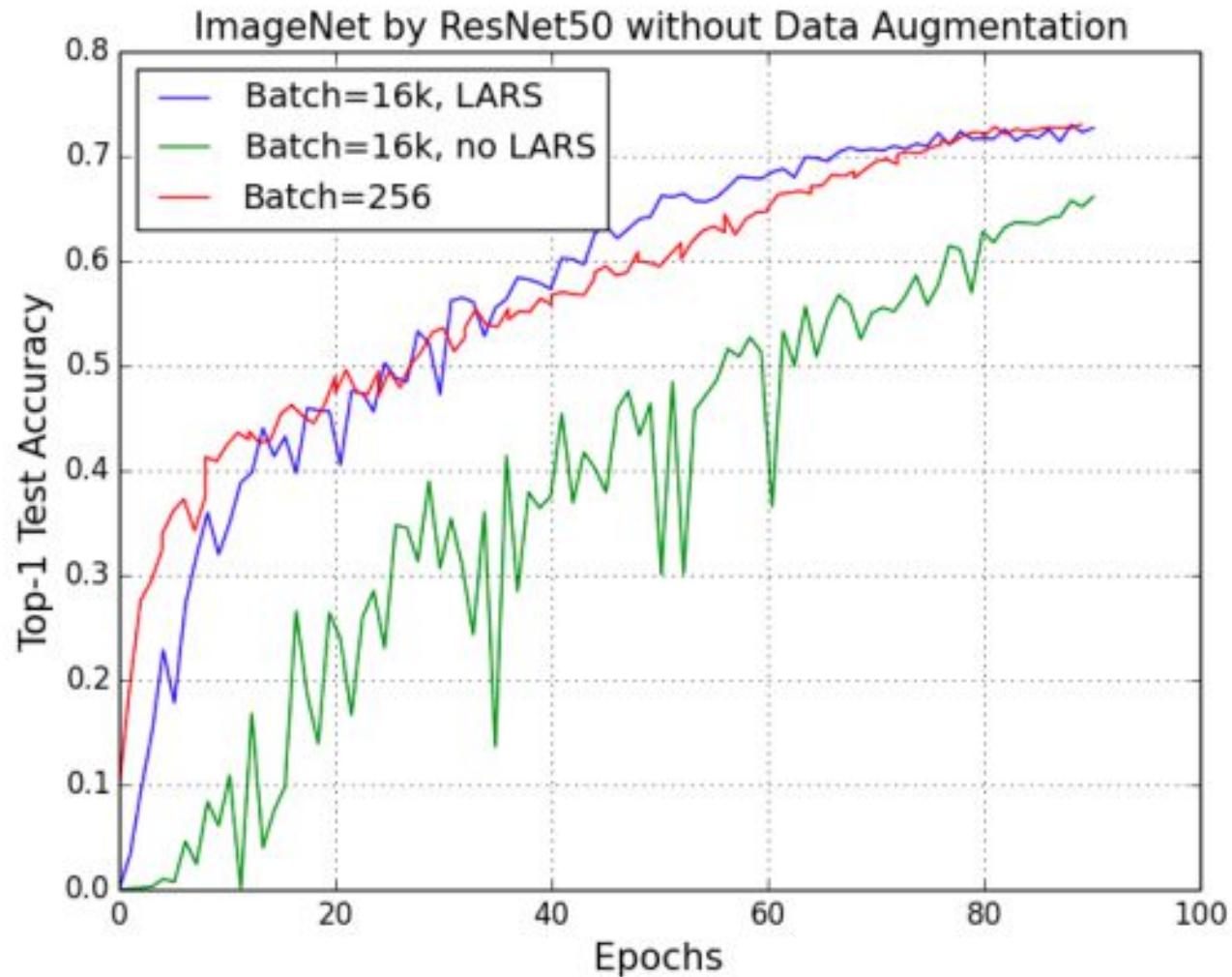
- Interpretable
- Convert into pre-trained models



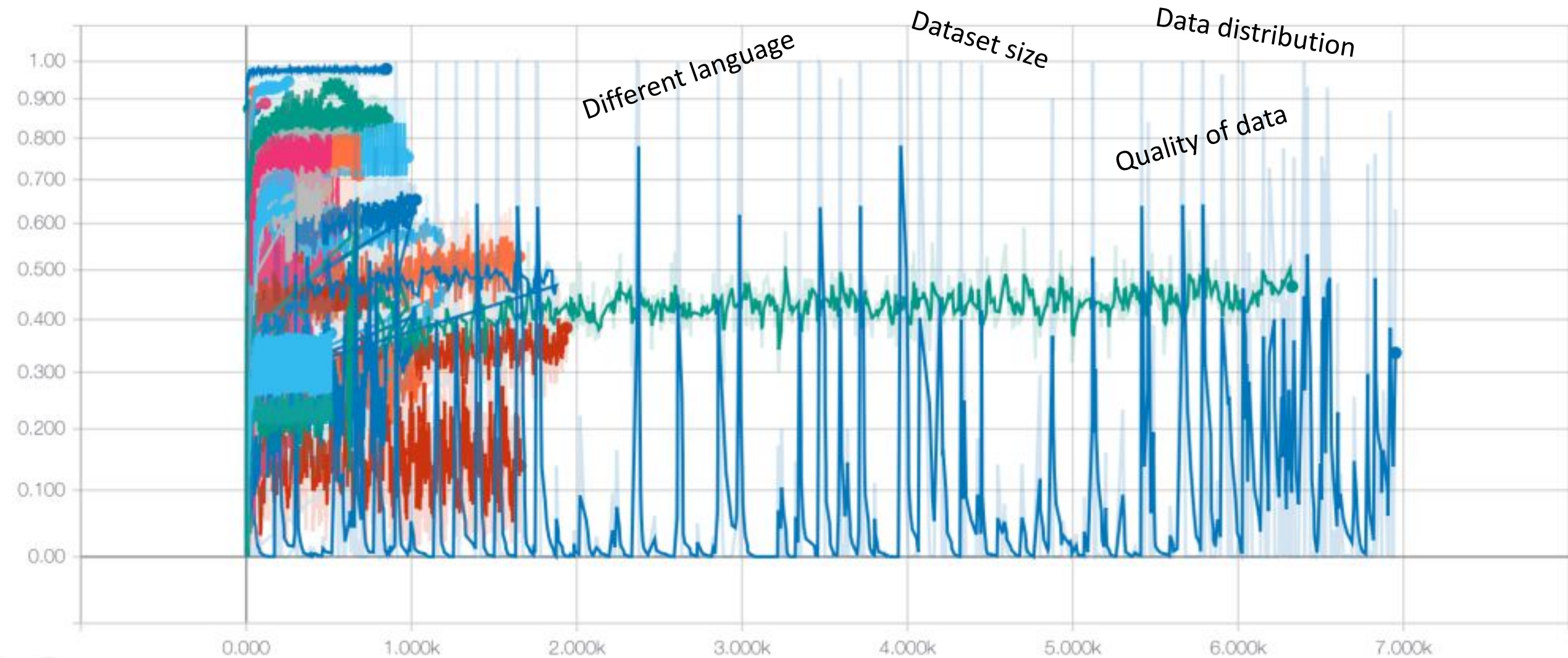
End to End Pipeline



End to End Pipeline : **TRAIN MODEL**



End to End Pipeline : **TRAIN MODEL**



End to End Pipeline : **TRAIN MODEL**



	round_epochs	loss		acc	first_neuron	activation	batch_size
1	100	0.4734066925011575	0.7916666630189866		48	<function elu at 0x7fa51833a268>	10
2	100	10.379157334566116	0.3489583383003871		12	<function relu at 0x7fa51833a488>	20
3	100	0.6171546266414225	0.683593756519258		12	<function relu at 0x7fa51833a488>	30
4	100	0.5872933422215283	0.744791672565043		24	<function relu at 0x7fa51833a488>	30
5	100	5.6245436910539865	0.6510416749709597		24	<function elu at 0x7fa51833a268>	10
6	100	0.5272156484425068	0.7552083330228925		48	<function relu at 0x7fa51833a488>	20
7	100	0.5109345514792949	0.7695312490686774		48	<function relu at 0x7fa51833a488>	30
8	100	0.47646385493377846	0.7773437485254059		12	<function elu at 0x7fa51833a268>	10
9	100	0.4572998268995434	0.7851562523283064		48	<function elu at 0x7fa51833a268>	30
10	100	0.49520680168643594	0.7734374993791183		12	<function elu at 0x7fa51833a268>	20
11	100	0.4905776670202613	0.7903645788319409		24	<function elu at 0x7fa51833a268>	30
12	100	0.514674260125806	0.7708333345750967		24	<function elu at 0x7fa51833a268>	20
13	100	5.624543756246567	0.6510416745829085		24	<function relu at 0x7fa51833a488>	20
14	100	0.527019191494522	0.7773437468179812		48	<function relu at 0x7fa51833a488>	10
15	100	0.555716585018672	0.7473958338766048		12	<function relu at 0x7fa51833a488>	10
16	100	10.317635461688042	0.3528645939659327		12	<function elu at 0x7fa51833a268>	30
17	100	0.5219061014940962	0.7643229172875484		24	<function relu at 0x7fa51833a488>	10
18	100	0.46097196203966934	0.7929687509313226		48	<function elu at 0x7fa51833a268>	20

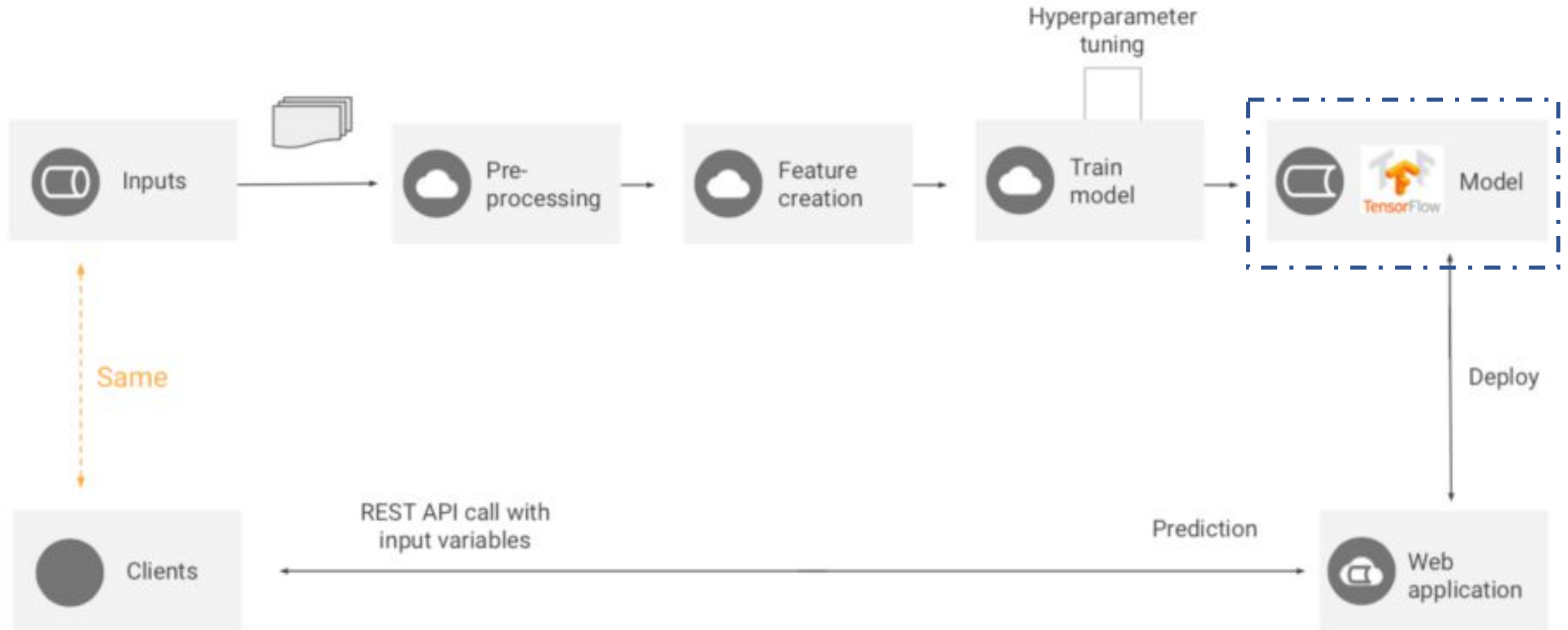
Colab link: <http://bit.ly/talosHPO>

End to End Pipeline : **TRAIN MODEL**

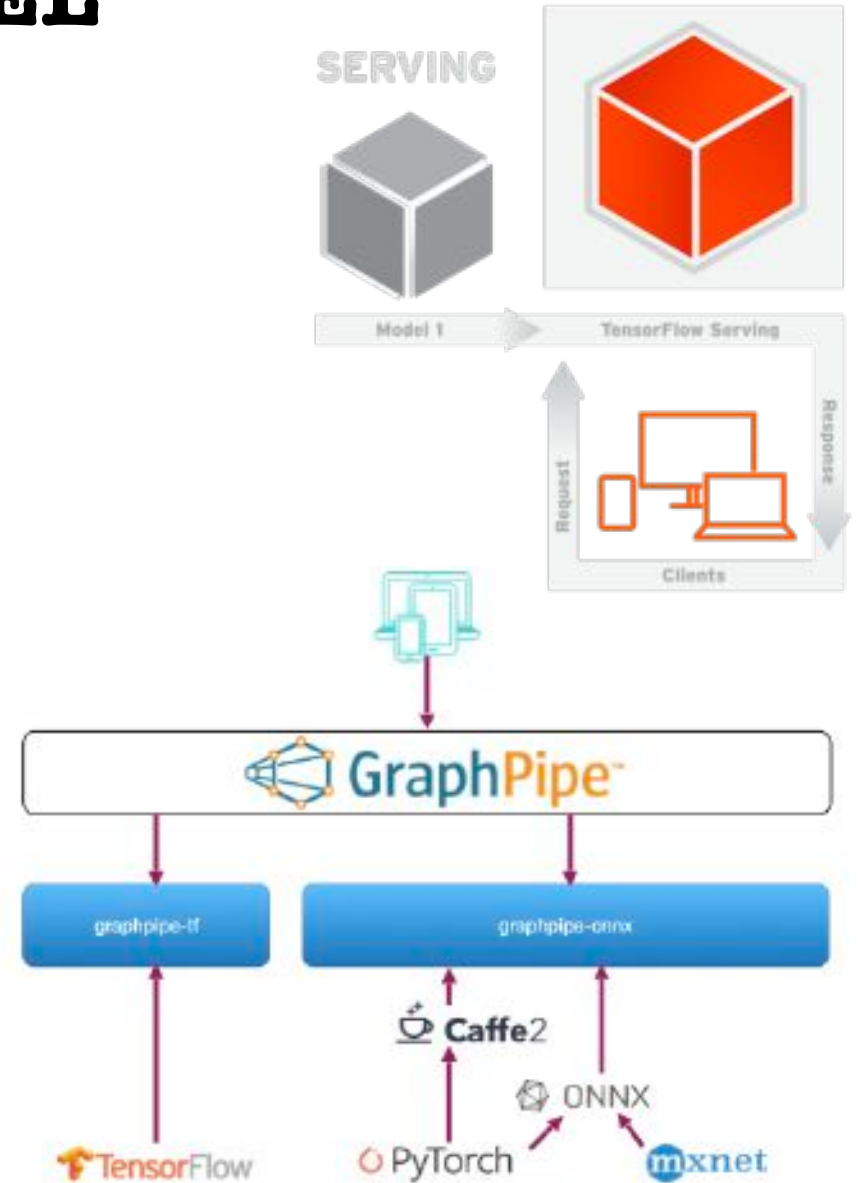


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<input type="checkbox"/>	2018-06-04 23:00:09	mlflow	train.py	05e956	0	1	0.578	0.288	0.742
<input type="checkbox"/>	2018-06-04 23:00:09	mlflow	train.py	05e956	0	0.5	0.578	0.288	0.742
<input type="checkbox"/>	2018-06-04 23:00:09	mlflow	train.py	05e956	0	0.2	0.578	0.288	0.742
<input type="checkbox"/>	2018-06-04 23:00:08	mlflow	train.py	05e956	0	0	0.578	0.288	0.742

End to End Pipeline



End to End Pipeline : **DEPLOY MODEL**



End to End Pipeline : **DEPLOY MODEL**

Post training optimizations

- Freezing**: That is, converting the variables stored in a checkpoint file of the SavedModel into constants stored directly in the model graph.

```
def freeze_graph(saved_model_dir):  
  
    from tensorflow.python.tools import freeze_graph  
    from tensorflow.python.saved_model import tag_constants  
  
    output_graph_filename = os.path.join(saved_model_dir, "freezed_model.pb")  
    output_node_names = "head/predictions/ExpandDims"  
    initializer_nodes = ""  
  
    freeze_graph.freeze_graph(  
        input_saved_model_dir=saved_model_dir,  
        output_graph=output_graph_filename,  
        saved_model_tags = tag_constants.SERVING,  
        output_node_names=output_node_names,  
        initializer_nodes=initializer_nodes,  
  
        input_graph=None,  
        input_saver=False,  
        input_binary=False,  
        input_checkpoint=None,  
        restore_op_name=None,  
        filename_tensor_name=None,  
        clear_devices=False,  
        input_meta_graph=False,  
    )  
  
    print "SavedModel graph freezed!"
```

‘**Shrinking** model size (to have less memory and disk footprints), and **improving** prediction latency.’

End to End Pipeline : **DEPLOY MODEL**

Post training optimizations

- Quantisation**: That is, converting any large float Const op into an eight-bit equivalent, followed by a float conversion op so that the result is usable by subsequent nodes.

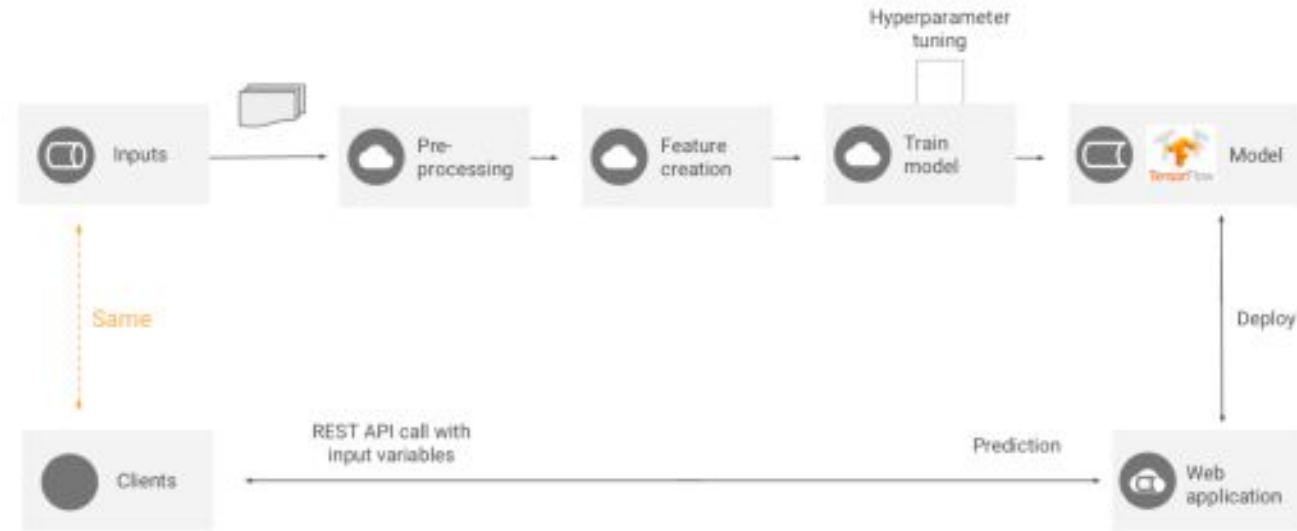
```
from tensorflow.tools.graph_transforms import TransformGraph

transforms = [ "remove_nodes(op=Identity)",
               "fold_constants(ignore_errors=true)",
               "fold_batch_norms",
               "fuse_resize_pad_and_conv",
               "quantize_weights",
               "quantize_nodes",
               "merge_duplicate_nodes",
               "strip_unused_nodes"
               ]

optimised_graph_def = TransformGraph(graph_def, input_names, output_names, transforms )
```

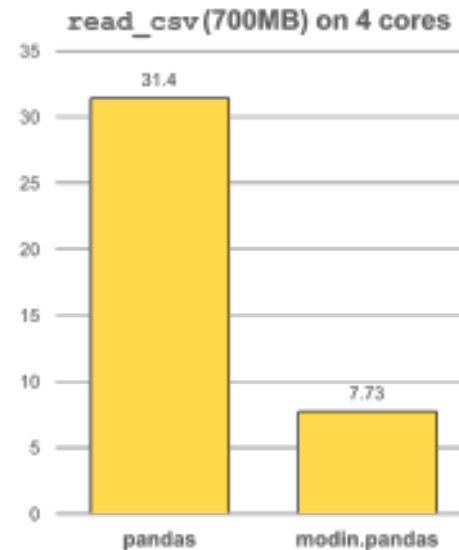
‘**Shrinking** model size (to have less memory and disk footprints), and **improving** prediction latency.’

Production Ready Pipeline



Must to have:

- Micro-service architecture
- Optimize each modules
- Versioning
- Opt pre-trained model

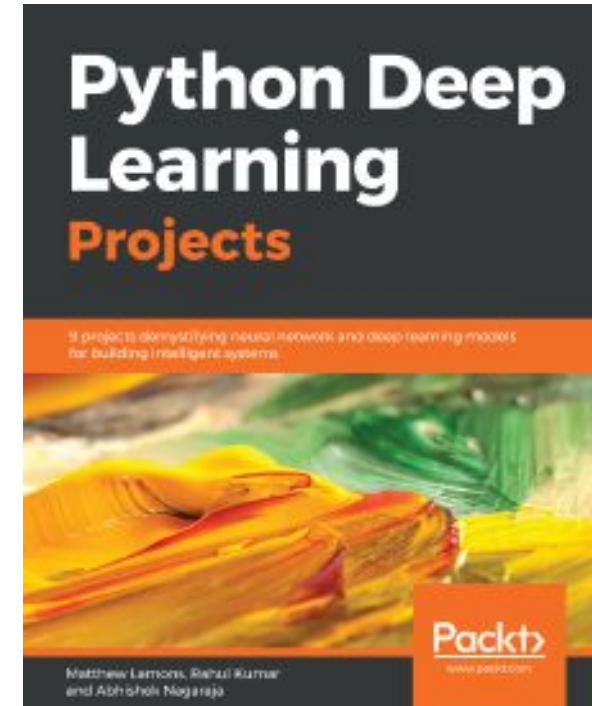


Thank you



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