NeoPulse® Framework

End-to-End AI Platform

AI DYNAMICS INC.

AI Dynamics™ at a glance

formerly DimensionalMechanics Inc ®

- Founded in 2015 as “DimensionalMechanics” in Bellevue, WA by a recognized veteran of the IT industry
- Four years of engineering by some of the most talented machine learning experts in the world
- Team of PhDs, physicists, mathematicians
- Name a “Gartner Cool Vendor for Data Science and Machine Learning” for 2018
- Partnered with Nippon RAD in Japan
- Soon to IPO

425Business
2017
Rajeev Dutt:
Entrepreneur of the Year

CIOReview
2018
20 Most Promising Cognitive Solution Providers

Gartner
2018
Gartner Cool Vendor in Data Science and Machine Learning

Clutch
2020
Clutch Top Software Developer in Australia

Why all the excitement about AI?

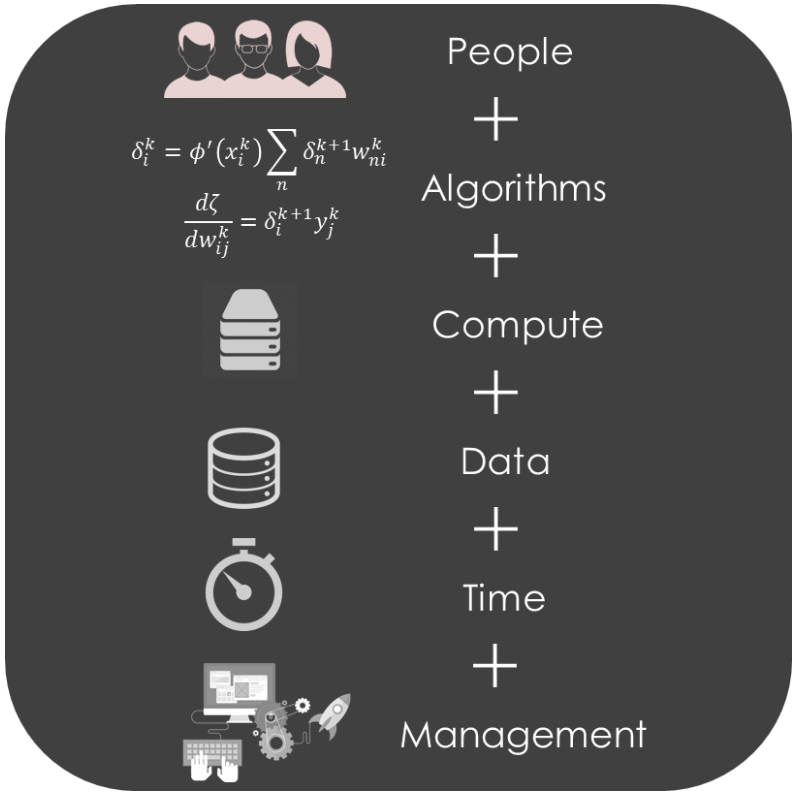
AI can:

- Perform mundane tasks- often better than humans
- Provide companies with a competitive edge by identifying market opportunities or avoiding business risk
- Accelerate the development of new drugs, materials, and technology
- Improve security and reduce crime
- Diagnose some illnesses better than doctors
- Protect children from harmful media content

“[AI is] The most important thing humanity has ever worked on...more profound than electricity or fire.”

Google CEO Sundar Pichai at the 2018 World Economic Forum in Davos

Cost of Machine Learning



$69M
spent by a hospital in Texas on an AI platform

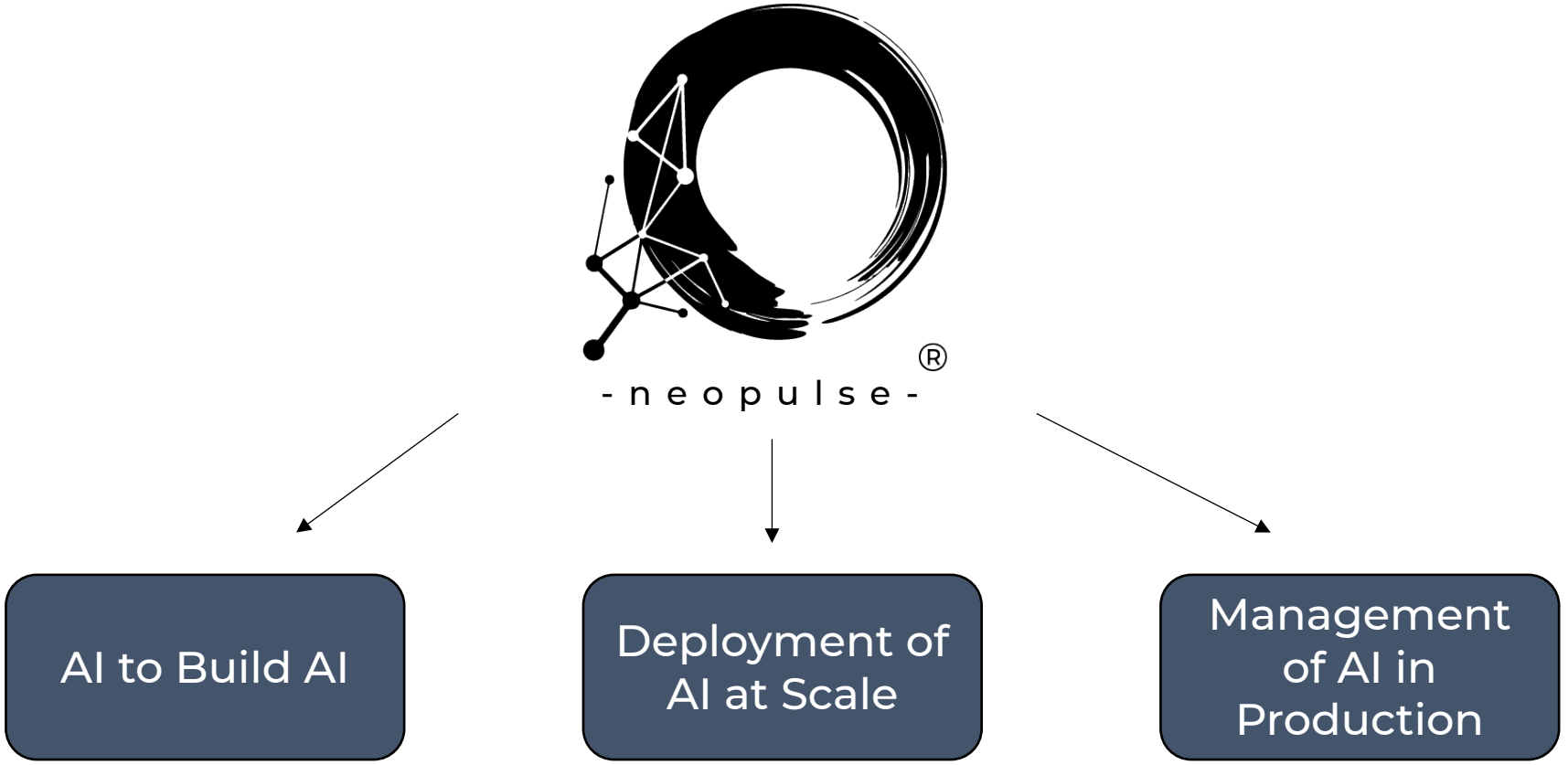
$880,000/yr
for a small team on a small project

In Seattle a machine learning engineer can earn **18%** more than a standard software engineer

Edgar Codd, then working at IBM's San Jose Research Laboratory in 1973 invented the revolutionary relational database model and built the prototype "System R", which would eventually become SQL

"Future users of large data banks must be protected from having to know how the data is organized in the machine (the internal representation)."
Edgar Codd

AN OPERATING SYSTEM FOR AI



AI TO BUILD AI

NeoPulse uses artificial intelligence to create artificial intelligence

It uses a vast database of machine learning algorithms and decides which one to use and how to tune the “hyper-parameters”

Like human engineers, it gets better with experience using something called “reinforcement learning”

DEPLOYMENT OF AI AT SCALE

Using the unique combination of PIMs and Runtimes, AI models can be deployed to hundreds or even thousands of endpoints

These endpoints can be managed centrally because each runtime exposes a rich set of APIs and the PIMs contain a large amount of metadata describing the AI model, model baseline performance, and machine readable instructions on use

MANAGEMENT OF AI IN PRODUCTION

Simply building an AI isn't enough – it has to be used.

In order for AI to be used, it has to be accessible by DevOps teams

DevOps care about:

- Uptime
- Performance characteristics
- Version control
- Lifecycle management

NeoPulse® enables DevOps teams to manage AI solutions without having to be AI experts

NeoPulse® Automates AI Generation

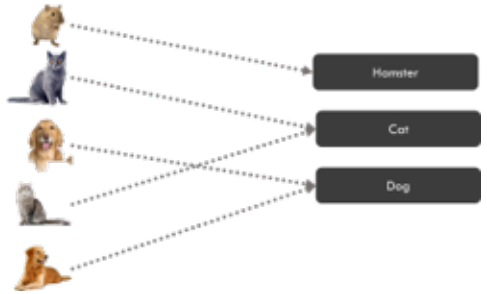
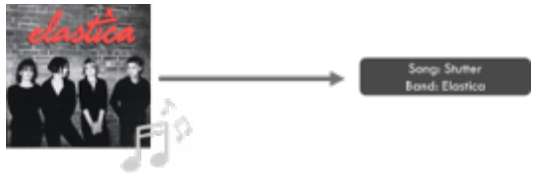
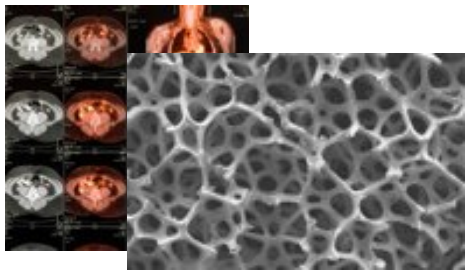


IMAGE CLASSIFICATION

OBJECT RECOGNITION

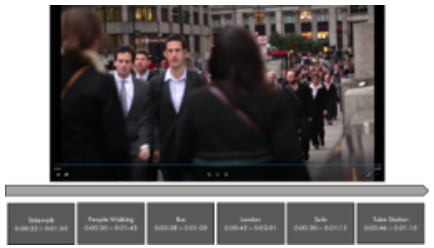


ACOUSTIC / AUDIO



DICOM & 3D IMAGING

TEXT ANALYSIS



VIDEO ANALYSIS

DATA ANALYTICS

BIOCHEMISTRY/GENOMICS/ PROTEOMICS

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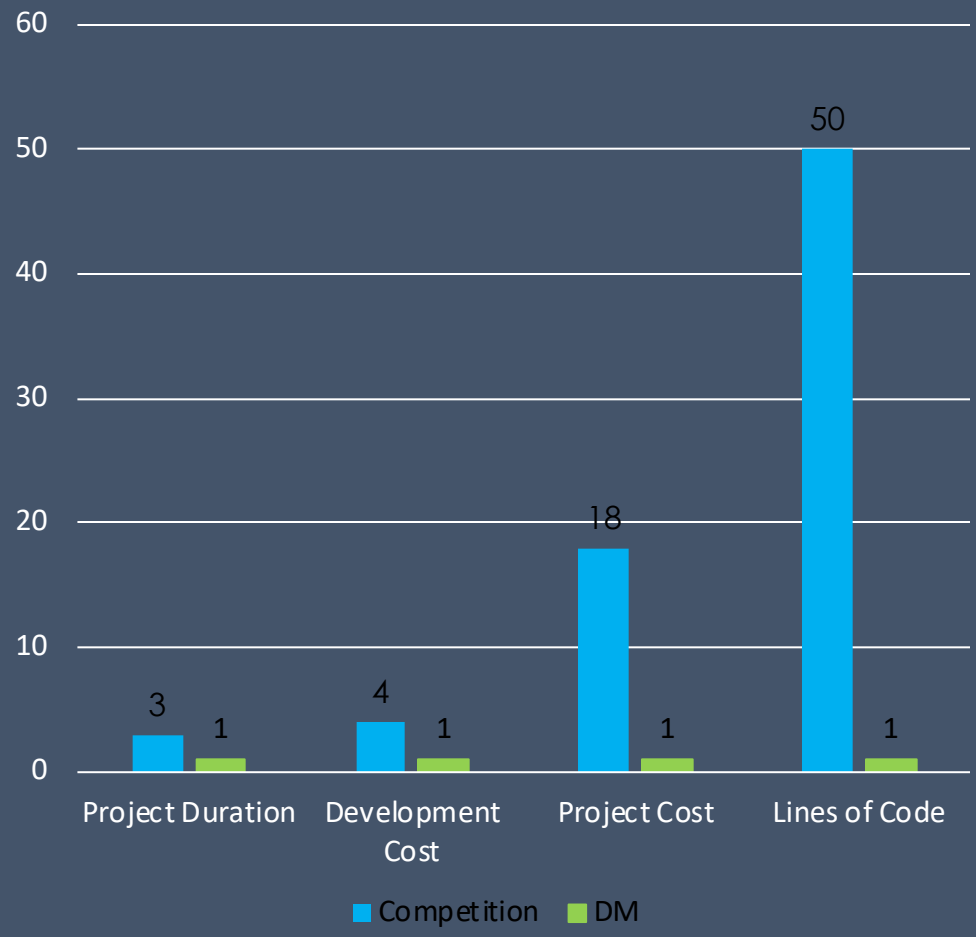
PATENTED DISRUPTIVE TECHNOLOGY

3x shorter project duration
4x lower developer cost
18x lower project cost
50x less code



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NEOPULSE® FRAMEWORK

NeoPulse® AI Studio: AI to build AI
Server application with a powerful AI called “the oracle” that is capable of automating the process of creating sophisticated AI Models. The oracle learns from its experience.

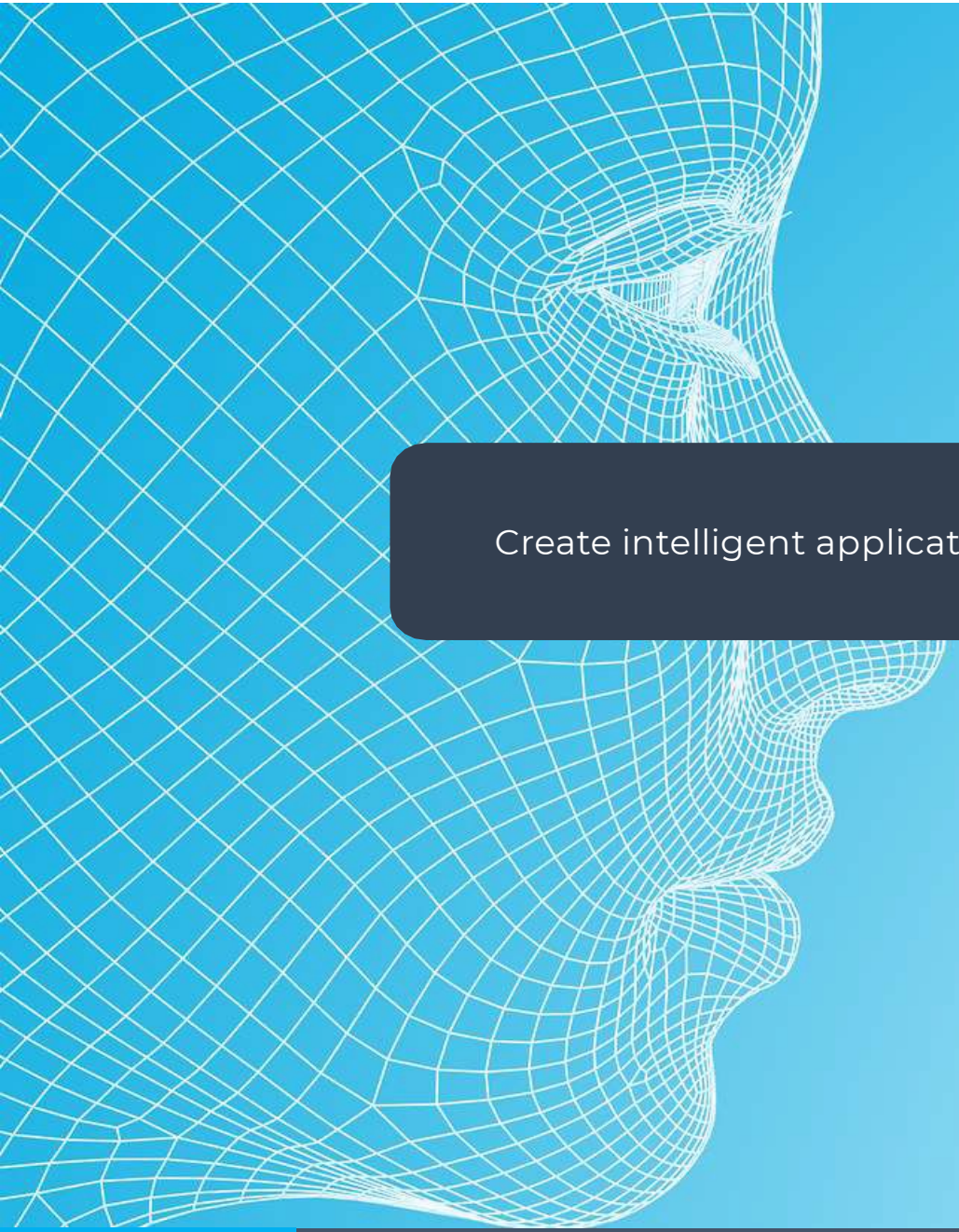
Portable Inference Models (PIM)
A neural network that is encapsulated in a container that can be queried using a runtime layer, also referred to as an AI Model

NeoPulse® Query Runtime
A program that is licensed by the organization to allow any application in the enterprise to access the AI model using a web-based (REST) API*

NeoPulse® Modeling Language (NML)
An intuitive DSL (domain specific language) developed by AI Dynamics® that is executed by the NeoPulse® AI Studio to automate the creation of new AI Models

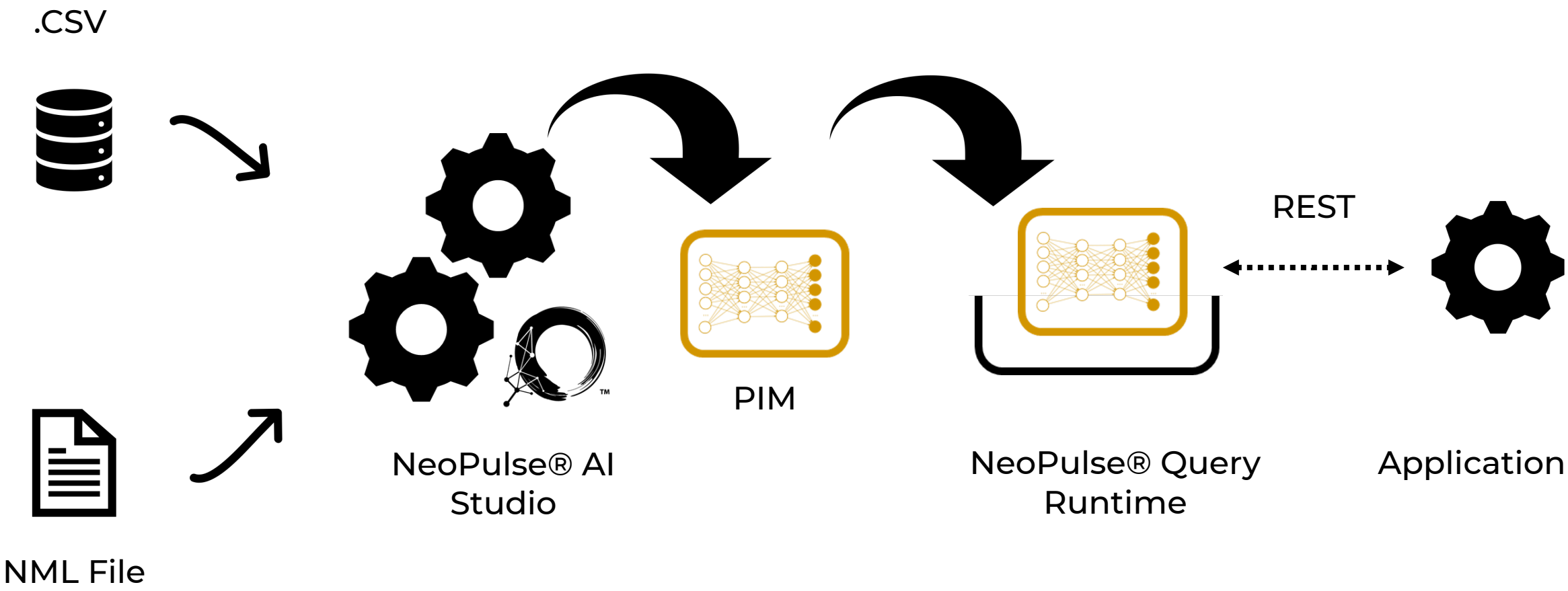
NeoPulse ® is as easy as it is versatile

AI DYNAMICS INC.



Create intelligent applications in **8** steps

NeoPulse® WORKFLOW



Curate your data and construct a CSV file

1

Without

0

With tumors

1

lung.csv

label	path
0	/images/negative/img_n_0001.jpg
0	/images/negative/img_n_0002.jpg
0	/images/negative/img_n_0003.jpg
	…
0	/images/negative/img_n_<..>.jpg
1	/images/positive/img_p_0001.jpg
1	/images/positive/img_p_0002.jpg
1	/images/positive/img_p_0003.jpg
	…
1	/images/positive/img_p_<..>.jpg

Assuming you have high quality images and properly formatted,
a simple script can construct the csv file – less than an hour.

Create the NML script

2

lung_classify.nml

```
oracle("mode") = "classification"
source:
    bind = "/DM-Dash/medical/lungtumor/lung.csv" ;
    input: x ~ from "path" -> image: [shape=[28, 28], channels=1] -> ImageDataGenerator: [rescale= 0.003921568627451];
    output: y ~ from "label"-> flat: [2] -> FlatDataGenerator: [] ;
    params: batch_size=32, number_validation=10000 ;
architecture:
    input: x ~ image: [shape=[28, 28], channels=1] ;
    output: y ~ flat: [2] ;
    x -> auto -> y ;
train:
    compile: optimizer = auto, loss = auto, metrics = ['accuracy'] ;
    run: epochs = 4 ;
    dashboard: ;
```

Copy one of the examples listed on the DM Github page
and modify it for your needs – less than an hour.

Compile and start training

3

lung_classify.nml

```
oracle("mode") = "classification"
source:
    bind = "/DM-Dash/medical/lungtumor/lung.csv" ;
    input: x ~ from "path" -> image: [shape=[28, 28], channels=1] -> ImageDataGenerator: [rescale= 0.0039215686274511];
    output: y ~ from "label"-> flat: [2] -> FlatDataGenerator: [] ;
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    input: x ~ image: [shape=[28, 28], channels=1] ;
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    x -> auto -> y ;
train:
    compile: optimizer = auto, loss = auto, metrics = ['accuracy'] ;
    run: epochs = 4 ;
    dashboard: ;
```
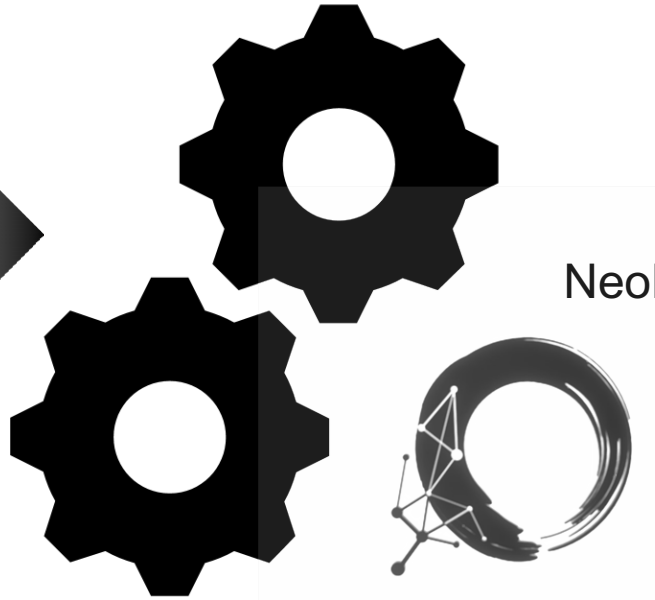

lung_classify.nml

lung.csv

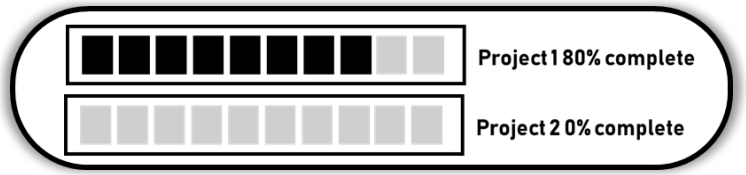


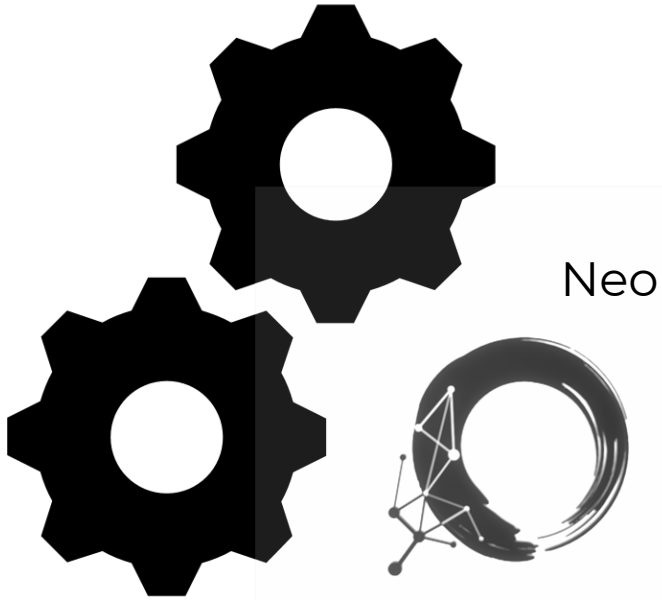
NeoPulse® AI Studio

Compiling the NML code (assuming no syntax errors) is immediate – seconds. NeoPulse® chooses from over 700,000 possible algorithms to determine the most optimal algorithm. ...training is another matter.

Training. . .

4





NeoPulse® AI Studio

Training can take time depending on the volume of data and the compute resources available.
There's nothing for you to do but the machine will be busy for a couple of days or more for a decent model.
Fortunately AI Studio employs a queuing model –so it doesn't stop you from starting the next project.

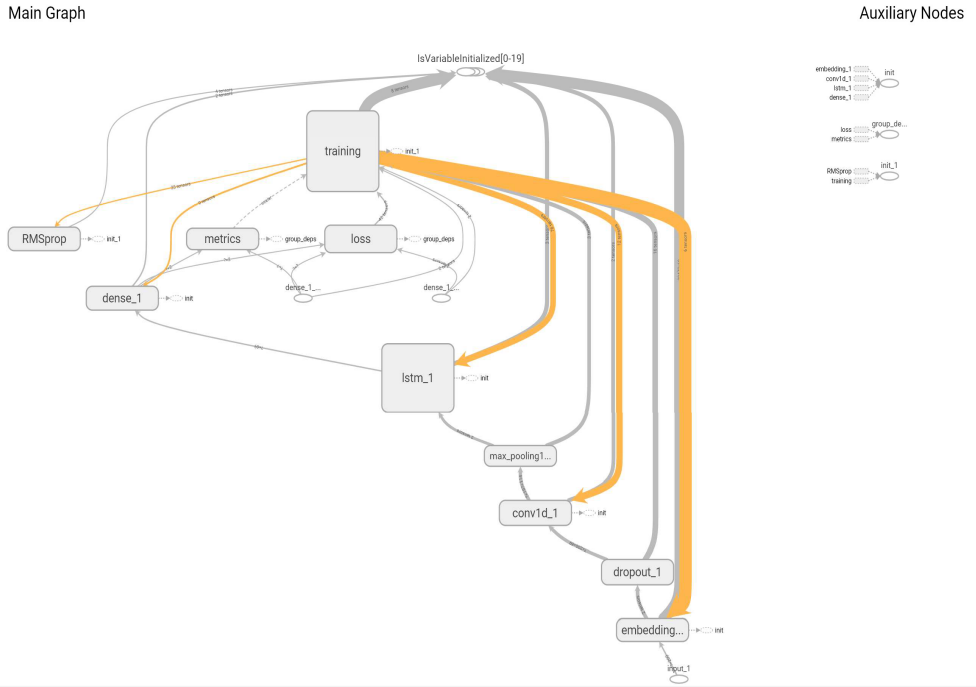
Evaluating...

```
(C) 2017-2018, DimensionalMechanics, Inc. All Reserved.
MODEL          ITER           STATUS           COMPILE_10__0         COMPILE_9__0    EMBED_DIMENSION 2_0_BI_LSTM_SIZE 2_0_POOL_LENGTH 2_0_NB_FILTERS_CN 2_0_LS
TM_SIZE   2_0_FILTER_LENGTH INP_SIZE_E      OUT_ACTIVATION
SkUPMO8Tm-0     0               TRAINING         'binary_crossentropy' 'sgd'           79              42              5               79              67
          7                  22378           'softmax'
SkUPMO8Tm-1     0               WAITING_TO_TRAIN 'binary_crossentropy' 'sgd'           79              42              8               79              67
          7                  22378           'softmax'
SkUPMO8Tm-2     0               WAITING_TO_TRAIN 'binary_crossentropy' 'sgd'           79              42              3               79              67
          7                  22378           'softmax'
SkUPMO8Tm-3     0               WAITING_TO_TRAIN 'binary_crossentropy' 'sgd'           79              42              5               79              67
          7                  22378           'sigmoid'
```

See the hyperparameter choices

5

Evaluate accuracy, loss etc.

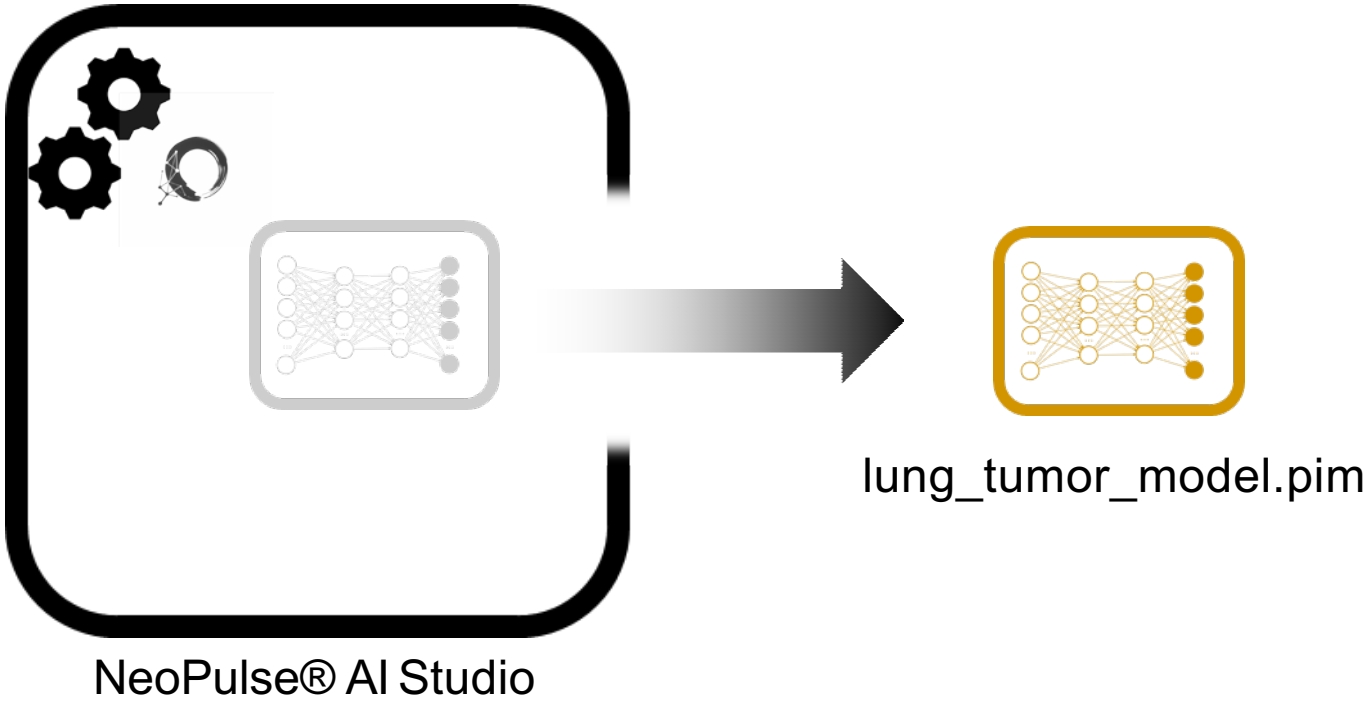


Visualize the underlying model generated by “the oracle”

AI Studio offers powerful tools to evaluate your model including validation accuracy, validation loss, seeing the hyperparameter choices, and visualizing the model generated by AI Studio.

Export a PIM file

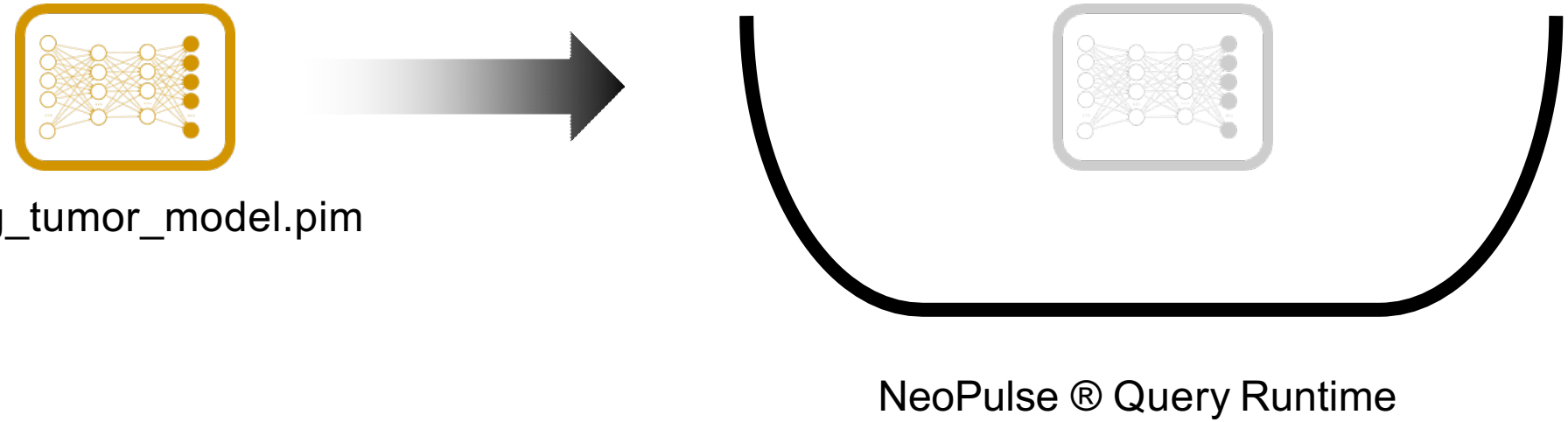
6



Exporting a PIM file is simple – choose from a set of models based on accuracy (for example) and simply export in a single call. The PIM is a file that can be moved from one machine to another (either locally or in the cloud).

Import a PIM file

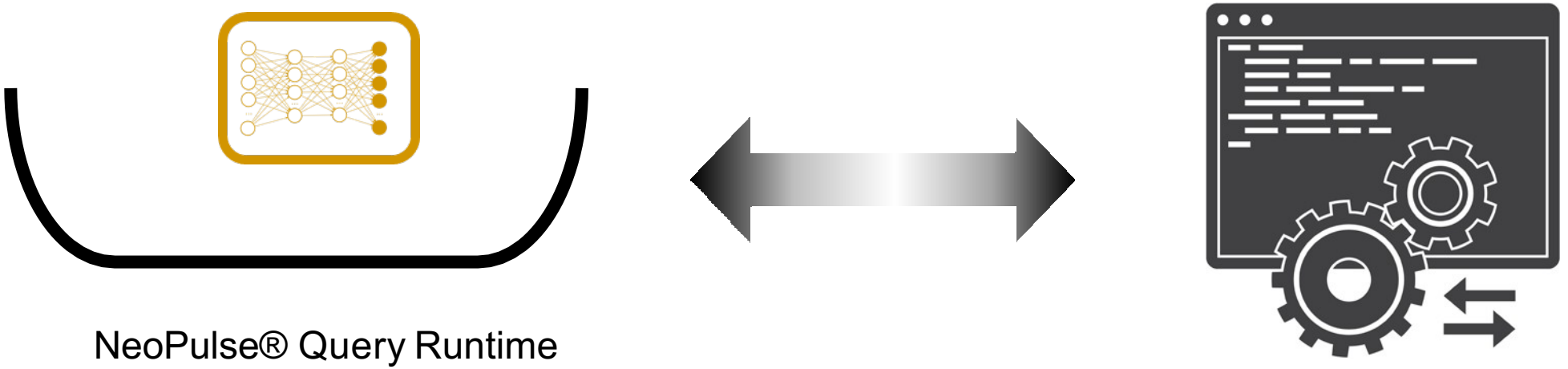
7



Once the model has been built, you can move the resulting PIM file from machine to machine as long as the NeoPulse Query Runtime has been installed. Importing the model into the runtime is a simple command – takes just a couple of seconds.

Call the model via a REST API from an application

8



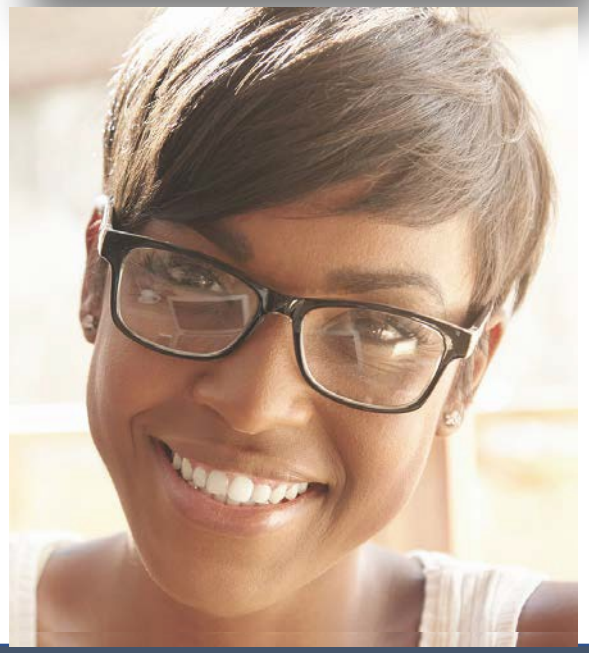
After importing the model, NeoPulse® Query Runtime automatically generates a RESTful API that allows applications to query the model directly. You don't need to build any custom APIs to call your model.

AI DYNAMICS INC.

Psidyne* is a medium sized business specializing in storage software. It was founded 10 years ago. It has 320 employees across the US and Europe and gross revenues of $108M per annum. Recent shifts in market have impa cted Psidyne sales, leading to a 20% drop in profits. Psidyne managers are under pressure to cut costs in their teams.

*Psidyne is a hypothetical case study based on a real customer

Hiro Sakaguchi
Age: 47
Profession: Engineering Manager @Psidyne
Background: Former Software Engineer
Team size: 14 software engineers + 3 contractors
Budget: $3.5M
Responsibilities: Manages an online store to allow customers to purchase software from Psidyne



Zoë Smith
Age: 27
Profession: Full Stack Software Engineer
Background: MS in Computer Science no ML experience
Team size: Individual Contributor
Budget: None
Responsibilities: Lead developer responsible for developing the forum and chat services on the Psidyne Store

Challenge

- The Psidyne online forums are heavily used by developers. Unfortunately, recently, there has been a surge of negative comments about the product as well as of the other developers.
- To combat the issue, Hiro hired a team of 3 contractors to moderate the forums and remove or act on the negative feedback. Unfortunately, with recent cutbacks, Hiro has been asked by finance to cut the three contractors.
- Hiro asks Zoë what to do about it. Zoë suggests machine learning but there's a problem – Hiro's team doesn't have any ML experts and the Psidyne data scientists are all in the core product development teams and would not prioritize the forums. They also told her that it would take a month and a half of machine learning work by a ML expert in their team and about 3 weeks to integrate the model into her application.

Business Impact

- Psidyne supports a rich and diverse developer community. Unfortunately the negative and unconstructive comments that have started to emerge on the developer forums have also resulted in fewer developers sharing their issues and asking questions.
- This has resulted in several problems:
  - Support costs have increased by nearly $400K/year because developers can't find their answers on the forums and are more likely to call the help desk
  - As support can't scale, this has resulted in a poorer support experience for customers – a number of them have said that they will not renew their contracts listing support issues as the primary reason. These contra cts are worth $2.1M in total
- Goals:
  - Eliminate the recurring cost of blocking the vast majority of troll content & recover $400K in support costs and prevent any further loss of customers due to poor support issues.
  - Recover developers lost from forums

Elizabeth Gardner
Age: 53
Profession: COO @ Psidyne
Background: 25 years experience in finance
Team size: 8
Budget: $2.5M
Responsibilities: The COO is responsible for the daily operation of the company, and reports to the CEO

Solution

Zoë uses NeoPulse® AI Studio to create a machine learning solution.

Although Zoë has no experience with machine learning, using NeoPulse® AI studio, she can use it's internal AI to build a highly sophistic ated AI model with data collected by the contractors as its training dataset.

Learning the NeoPulse Modeling Language (NML) takes her a couple of days. The AI Studio internal AI constructs the deep learning model architecture in seconds and then in two days of training, she is able to export a model that is 92% accurate.

Using the NeoPulse® Query Runtime (NPQR), she c an deploy the AI model on a server and then build a web applic ation that c alls the NPQR RESTinterface to check if a user submitted comment is positive or negative.

The whole project takes Zoë two weeks!

Outcome

As a result of using a machine learning solution, inappropriate content dropped dramatically in the Psidyne forums

- Engineers started returning to the forums
- Support cost dropped
- Satisfaction increased as a result of engineers helping engineers
- Several accounts could be saved as a result
- Zoë didn't have to learn about ML, Python and Keras and could build a highly accurate model in 6 hours rather than 3 weeks
- Zoë's anti -troll solution is more accurate than humans! (80% is the mean accuracy for humans)

It is estimated that this simple fix will save Psidyne over $3M per year

BOARD: AI DYNAMICS TEAM

BOARD OF DIRECTORS

Rajeev Dutt
CEO & President

17 years in high tech in senior engineering and management. Veteran of Intel, Microsoft, HP & BBC. CEO of two media/AI oriented start -ups. Extensive background with large data systems and predictive analytics, Hon. BSC University of Toronto and MSC/PhD Candidate Oxford University Theoretical Physics

Bob Genise
Founding Investor/Board Member

35+ years operating experience, Exe cutive Management, Investor, formerly CEO of DAE Capital, CEO of Boullioun Aviation Services, SVP of the Chemical Business Credit Corporation at the Chemical Bank including serving as Managing Director for the bank's Special Finance Group in London. Board member of Frontier Airlines, PATSAerospace and Aergen Aviation Finance Ltd. Member Board of Trustees Museum of Flight in Seattle and Advisory Board member of the Albers School of Business at Seattle University.

Kent Johnson
Founding Investor/Board Member

35+ years operating experience as CEO, CFO, Investor, Managing Director – investment banking and VC firms and former CPA with Arthur Andersen. Past direct involvement in over 50 startup companies, including F5 Networks (FFIV). Currently ManagingDirector of Aebig & Johnson Business Resolutions, LLC, and Adjunct Professor Seattle University. Former Trustee Seattle University, Endowed the SU Lawrence K. Johnson Chair of Entrepreneurship , Currently Board Chair and/or Director of Halosource (HALO.L), Vera Whole Health, Ro Health, and Global Energy Partners.

Tom Sato
Board Member

Mr. Sato is a serial entrepreneur, started his career as the original Window product manager for Japan for Microsoft Corp. where he was responsible for licensing and launching Window 1.03 to 3.0 to over 20 Japanese PC companies, then went on to start his e-commerce startup in Silicon Valley and Japan. He founded Tokyo IPO, Japanese IPO portal and Innovation Finders Capital GP LLC (WA) where is worked closely with State of Washington to develop Japan-Washington innovation ecosystem. He is currently principal owner of Tom Sato Business Development where he helps various governments on bilateral trade and innovation matters.

BOARD: AI DYNAMICS TEAM

BOARD OF DIRECTORS

Mike Ryder
Board Member

Mike was most recently senior vice president at Blizzard Entertainment, Inc., where he co-led story and franchise development for premier developer and publisher of interactive entertainment software. He has deep experience formulating successful plans to enter new markets, restructuring and returning companies to profitability and establishing new operations and strategic partnerships in emerging markets.