GRAPH+AI
SUMMIT
organized by **TigerGraph**

Leveraging Ontology-driven Swarm Intelligence in Healthcare and Epidemiology Use Cases using knowledge graphs
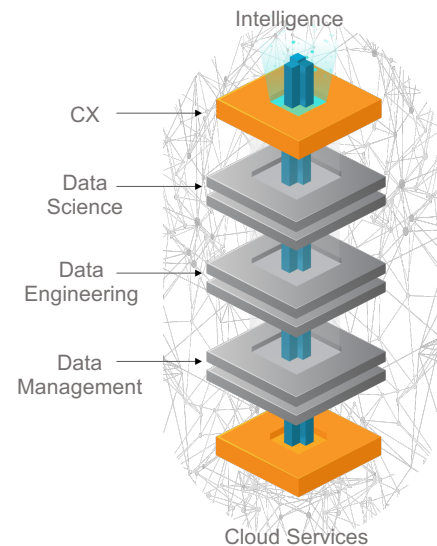
October 15, 2021

Maria Singson, Ph.D. & Kevin Pochapin

MASTECH
infoTrellis

1

Quick Intro

Dr. Maria Singson
VP & GM Data Science

Kevin Pochapin
VP, Client Partner

MASTECH
infoTrellis

We architect
Enterprise Intelligence,
powered by
Ontology-driven
knowledge graphs and AI,
to enable
agile innovations
and quickest paths to value.

Intelligence

CX

Data
Science

Data
Engineering

Data
Management

Cloud Services

Some of the work we do in Healthcare

~ 8 Mn

In annual savings from efficiency improvement and reduction in manual data entry

…through Implementation of **SMART Ingestion engine** enabling a single stream of data ingestion from structured & unstructured sources. Meeting client view of **moving faster** than competition via **delivery** of **architectural excellence**

10X

IMPROVEMENT IN NEXT-BEST-OFFER MODEL PERFORMANCE for Insurance Major

…through implementation **Cloud-based Big Data Lake**, integrating and correlating data from 15+ (pilot) data sources. Delivered first **Customer 360** view via data residing in multiple transactional systems, enabling **advanced real-time analytics**

40%

INCREASE IN EFFICIENCY for a leading US Based Healthcare client

…through implementation of a **Data Analytics platform** centred around Hadoop and other related Big Data technologies, in order to optimize operations through **automation and enable effective analytics**
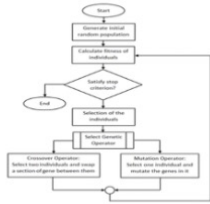
Swarm Intelligence

- ❑ Decentralized intelligence from seemingly unconnected, disparate groups or data
- ❑ Accomplishes big picture objectives via localized self organization and division of labor
- ❑ Each local agent does not have to "know" the overarching objective
- ❑ They just have to be harmonious with one another.
- ❑ No hub to "report to"

Example Use Cases:
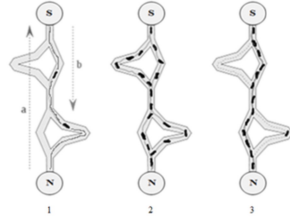
... Traffic **Optimization**

... Production Line / Supply Chain **Optimization**

... Drug Efficacy vs. Side Effects **Optimization**

... Facilities Staffing and Maintenance **Optimization**

... **Distributed Reconnaissance** for Defense Robotics

Popular Swarm Algorithms
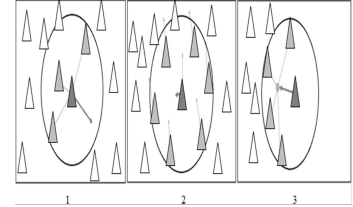
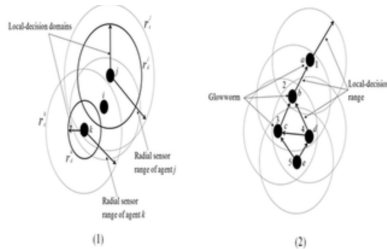❑ **Genetic Algorithms & Differential Evolution** – Survival of the fittest

❑ **Ant Colony Optimization** – Search for pheromones, decentralized addition of pheromones

❑ **Particle Swarm Optimization** – Flocks of birds, schools of fish – particles, position, velocity, inertia, neighborhood

❑ **Glow Worm Swarm** – Luminescence-seeking sensors
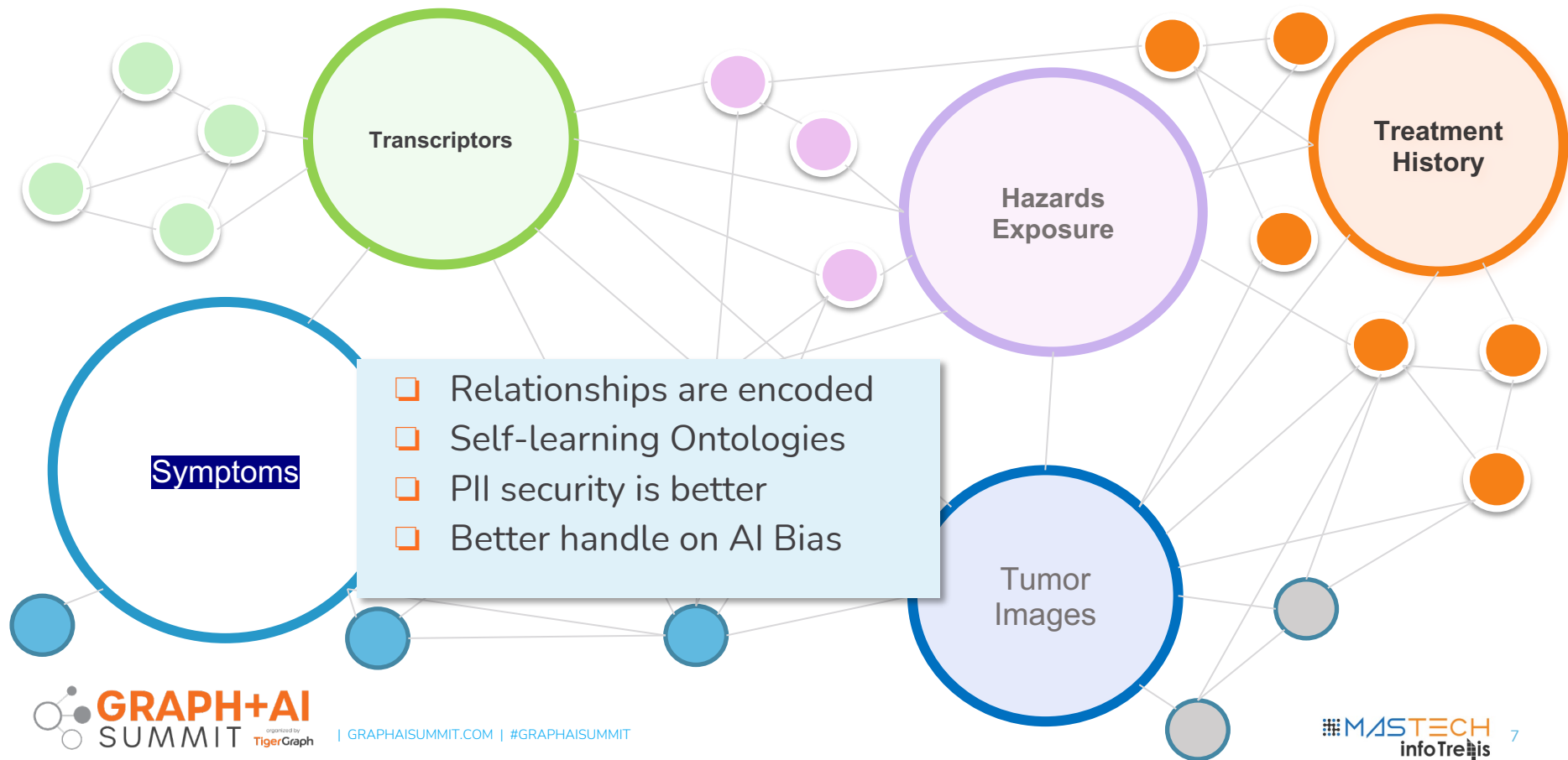
❑ **Cuckoo Search Algorithm** – Random nest selection that influence the survival of the egg laid in it. Host birds can choose to throw away the egg, ultimately identifying nests that hatch the fittest eggs. This is a PSO variant algorithm

❑ **Artificial Bee Colony** – Nectar gathering behavior of bees, with roles defined as employees, onlookers and scouts

For Healthcare,...

- **Small but Mighty!** Micro Robotic Surgery

- **Smooth Operator!** Solving Resource Allocation Problems at Hospitals; Physician Shift Assignment

- **Blockchain Diagnostics Engine.** Swarm learning across decentralized databases of patient data

Why Knowledge Graph is Perfect for Swarm Learning...

Transcriptors

Hazards Exposure

Treatment History

Symptoms

Tumor Images

- ❑ Relationships are encoded
- ❑ Self-learning Ontologies
- ❑ PII security is better
- ❑ Better handle on AI Bias

thank you.

Contacts:
Dr. Maria Singson
VP & GM, Data Science
maria.singson@mastechinfotrellis.com

Kevin Pochapin
Executive Client Partner
kevin.pochapin@mastechinfotrellis.com