ESC Cardiovascular AI Round Table – HealthSage AI

From (unstructured) data to insights & workflow automation
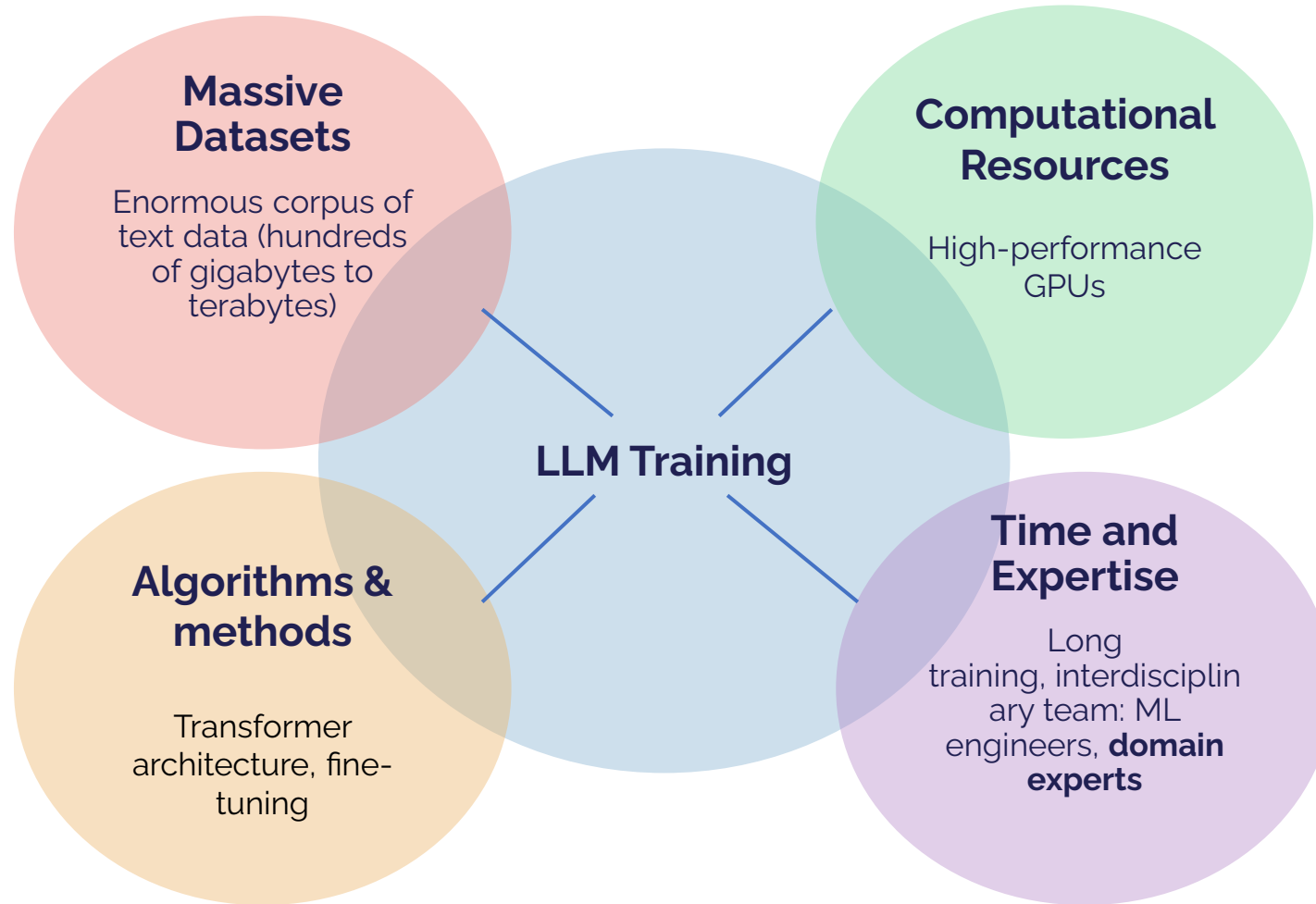
November 13, 2024

General insights on Large Language Models

- **What are Large Language Models?**
  - Artificial intelligence models designed to understand, generate, and manipulate human language on a large scale.

- **Significance in AI:**
  - **Revolutionizing NLP Tasks:**
    - Enable more natural interactions between humans and machines.; e..g., chatbots, virtual assistants.
  - **Advancements in Understanding Context:**
    - Ability to grasp nuances, idioms, and context in language.
  - **Facilitating Research and Development:**
    - Serve as foundational models for various AI applications across industries (**healthcare**, finance, education, and more).

- **Status and trends**
  - Innovation "exploded" over past 2 years; >1M models on HuggingFace, ~7 leading models "at par", costs dropped 100x over past year
  - From super large models that cater for all use cases to "multi-model" setups where smaller models are being optimized for specific tasks
  - From cloud only deployments to hybrid environments (e.g, cloud, edge)

Training an LLM: key components

Massive Datasets

Enormous corpus of text data (hundreds of gigabytes to terabytes)

Computational Resources

High-performance GPUs

LLM Training

Algorithms & methods

Transformer architecture, fine-tuning

Time and Expertise

Long training, interdisciplinary team: ML engineers, **domain experts**

(Large) generalist vs (smaller) dedicated models
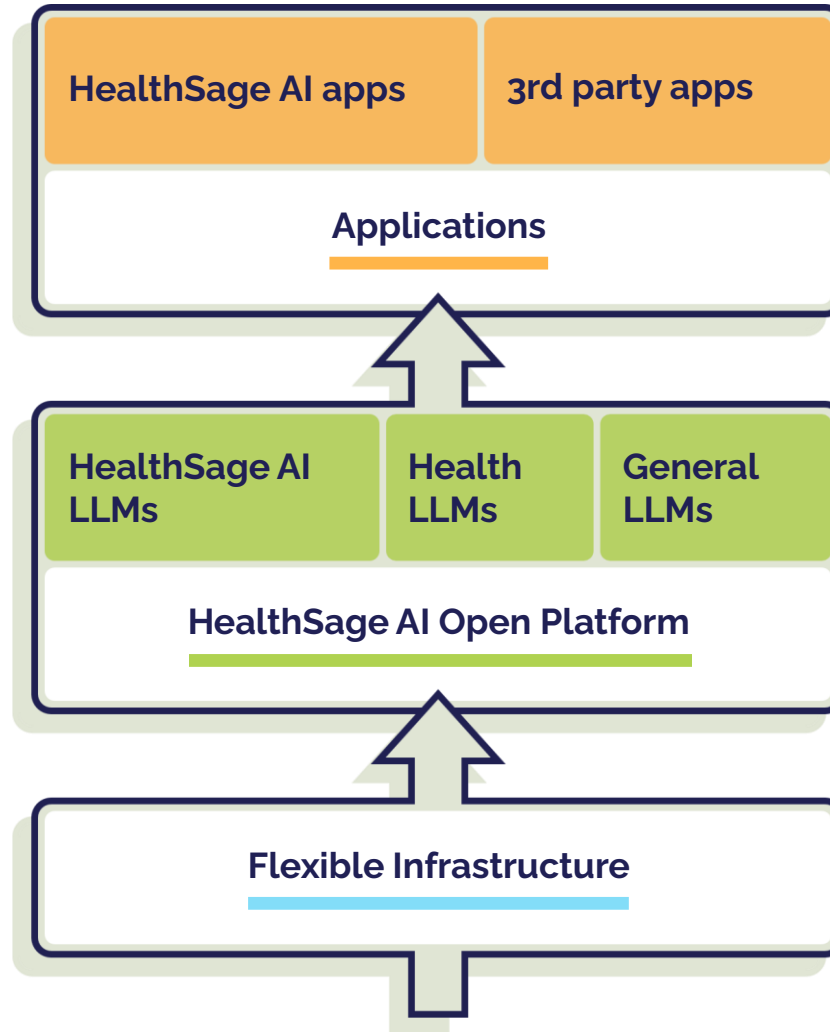
Generalist LLMs: Impressive but Not Always Optimal

- Large models like GPT-4 show remarkable general capabilities
- Excel at a wide range of tasks without specific training
- Often proprietary and therefore limited control. Large models can be expensive

The Power of Smaller, Focused Models

- Research shows smaller, specialized models can outperform large generalists in specific, well-defined tasks
- Need for less data
- Less resource demanding

Open & secure platform for Healthcare Gen AI

HealthSage AI apps | **3rd party apps**

Applications

HealthSage AI LLMs | **Health LLMs** | **General LLMs**

HealthSage AI Open Platform

Flexible Infrastructure

Applications integrated in your workflow
- First apps available in Q4 2024
- Expand app portfolio incl. 3rd party AI apps

Our Open Platform
- Multiple LLMs supported
- Always access to state-of-the-art models
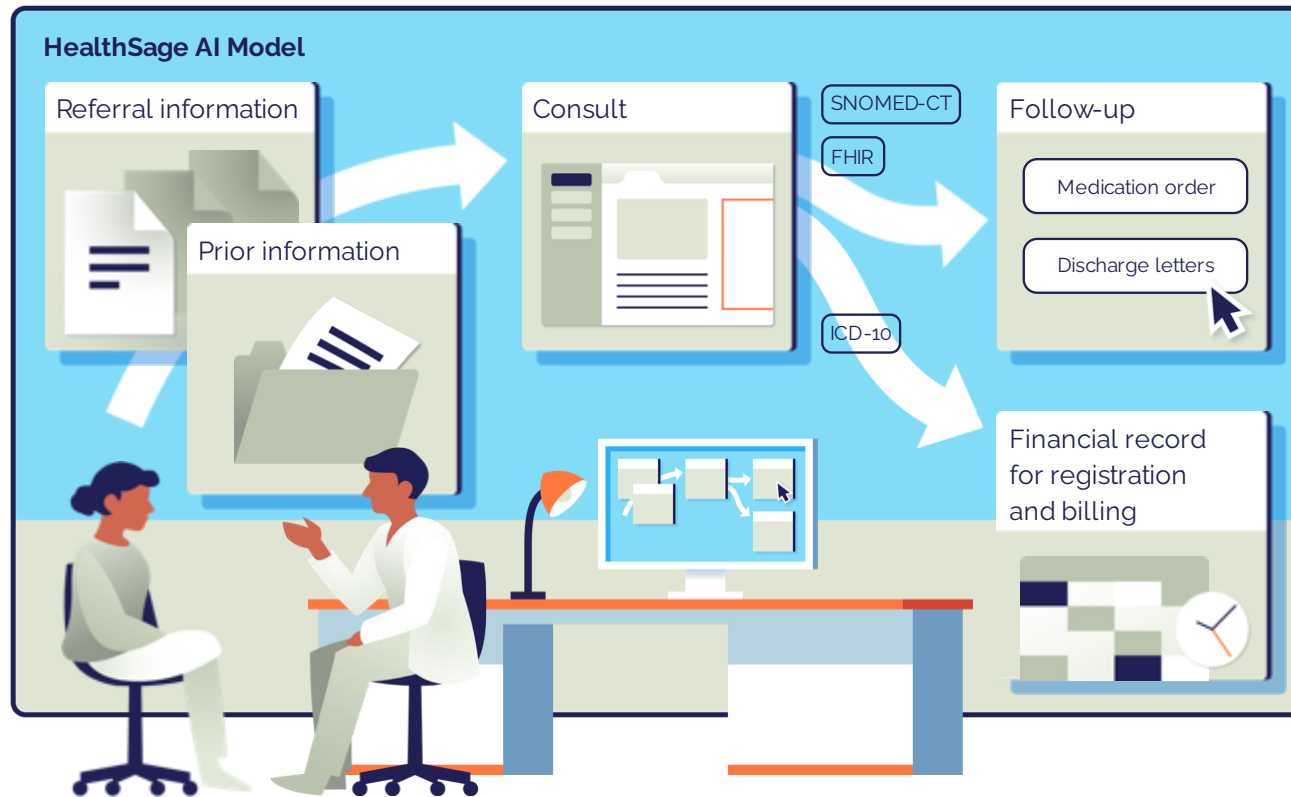- Secure, private, and regulatory compliant

A flexible infrastructure
- Cloud agnostic & on-device

Implementing HealthSage AI models in the workflow
Automated workflows & increased data quality

Converting unstructured clinical text into FHIR, SNOMED-CT, and ICD-10

HealthSage AI Model

Referral information

Prior information

Consult

SNOMED-CT

FHIR

ICD-10

Follow-up

Medication order

Discharge letters

Financial record for registration and billing

Potential applications

- Structured overview medical history

- Updated problem list

- Automated discharge letters

  - Tests and treatment

  - Follow-up

  - Clinical reporting

- Improve billing accuracy

How we trained our models
In partnership with AUMC

1. Dataset preparation

Synthetic data
- Full control
- No cleaning needed
- Anonymized

Real-world data
- Clinical notes/letters
- Open-source datasets
- AUMC collaboration

2. Select powerful pretrained Open-Source model
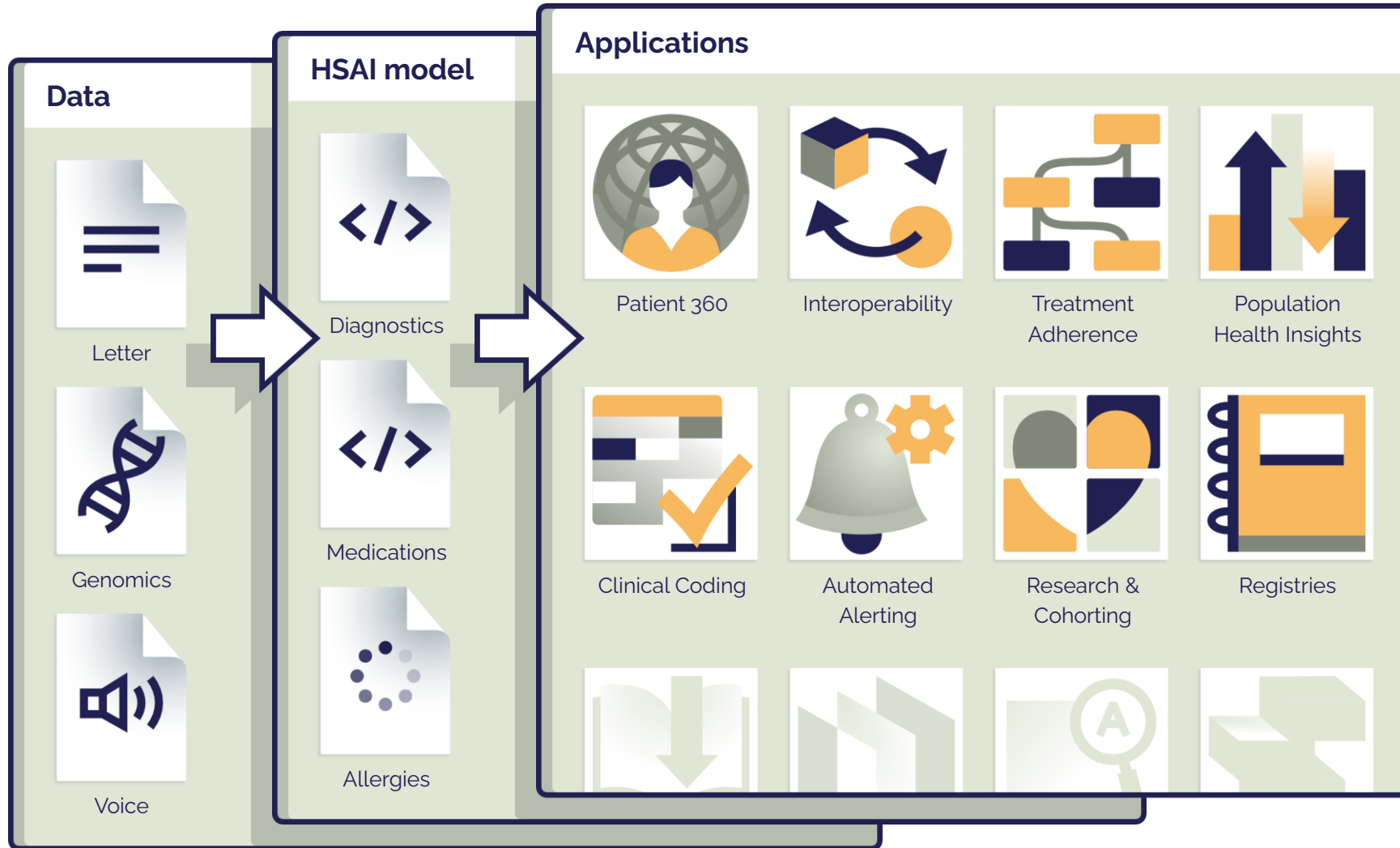(e.g. Mixtral, Llama, etc..)

3. Fine-tuning
Harvesting the power of huge training efforts

Other key focus areas

- Context length improvements

- Medical "knowledge"

- Controlling hallucinations

- Prompt "locking"

- Multiple sizes

From data (silos) to actionable patient insights

Data
- Letter
- Genomics
- Voice

HSAI model
- Diagnostics
- Medications
- Allergies

Applications
- Patient 360
- Interoperability
- Treatment Adherence
- Population Health Insights
- Clinical Coding
- Automated Alerting
- Research & Cohorting
- Registries

- Capture once, use many times

- Leverage real-time and historical data

- Consume various apps via one API

- Or built & share your own apps

Challenges (for start-ups) & opportunities (for ESC)

- Access to diverse, high quality, annotated data sets

- Thought leaders willing to embrace AI early on – development & integration in workflow

- Level of awareness & education on AI, Legislation, and IT – separate "fact" from "fiction"

- Scaling beyond early adopters – "re-use" vs "redo"
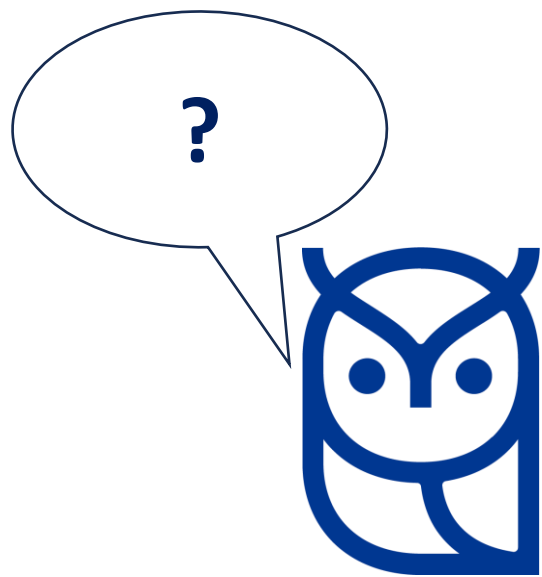
Thank you for your time

Questions?

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