

# SAGES – The Perspective of a Society

World Summit AI– Montréal – April 20<sup>th</sup>, 2023

**Ozanan R. Meireles, MD**  
**Chair of the Artificial Intelligence Task Force**  
**On behalf of SAGES**



# SAGES



## Society of American Gastrointestinal and Endoscopic Surgeons

- Established in 1981
- Over 7,000 members worldwide
- Focused on advancing patient care through education, research, innovation, and leadership



MASSACHUSETTS  
GENERAL HOSPITAL



# SAGES



- Pioneering Minimally Invasive Surgery (MIS)
- Comprehensive Education & Training
- Annual meetings, webinars, workshops, and fellowships
- Promoting global collaboration and sharing of best practices
- Cutting-edge Research & Innovation
- Fostering the development of new surgical techniques, devices, and technologies

# SAGES AI Development

## Foundational work

- Annotation ✓
- Data Structure and Use ✓
- Governance Policies, Regulations, and Oversight

## Structural needs

- Video Data Acquisition Framework ✓
- Management through data lifecycle

## Knowledge creation and dissemination

- Scientific Research ✓
- Education ✓
- Cultural Transformation



# SAGES AI Taskforce Projects

- Annotation
- Video DATA Structure, Use, and Exploration
- Surgical AI Governance, Policies, and Oversight
- Video Acquisition Framework
- Critical View of Safety Challenge
- Education and Cultural transformation



# Solution

## Foundational work

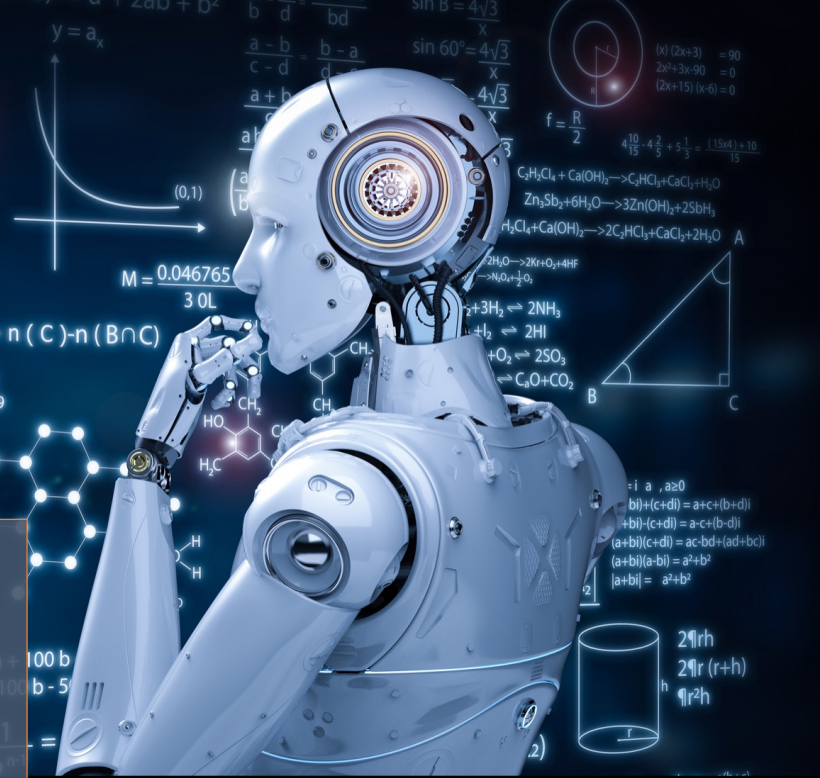
- Annotation ✓
- Data Structure and Use ✓
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## Structural needs

- Video Data Acquisition Framework ✓
- Management through data lifecycle

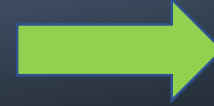
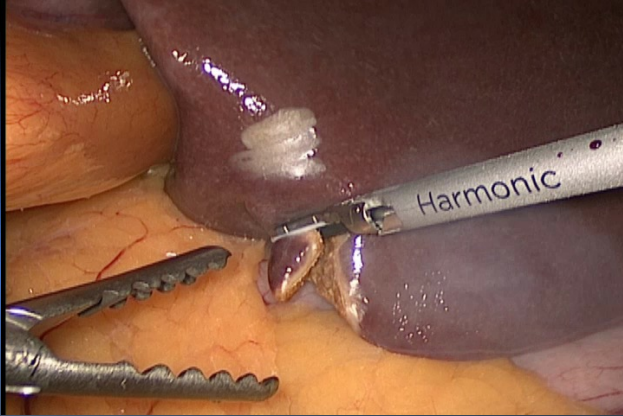
## Knowledge creation and dissemination

- Scientific Research ✓
- Education ✓
- Cultural Transformation

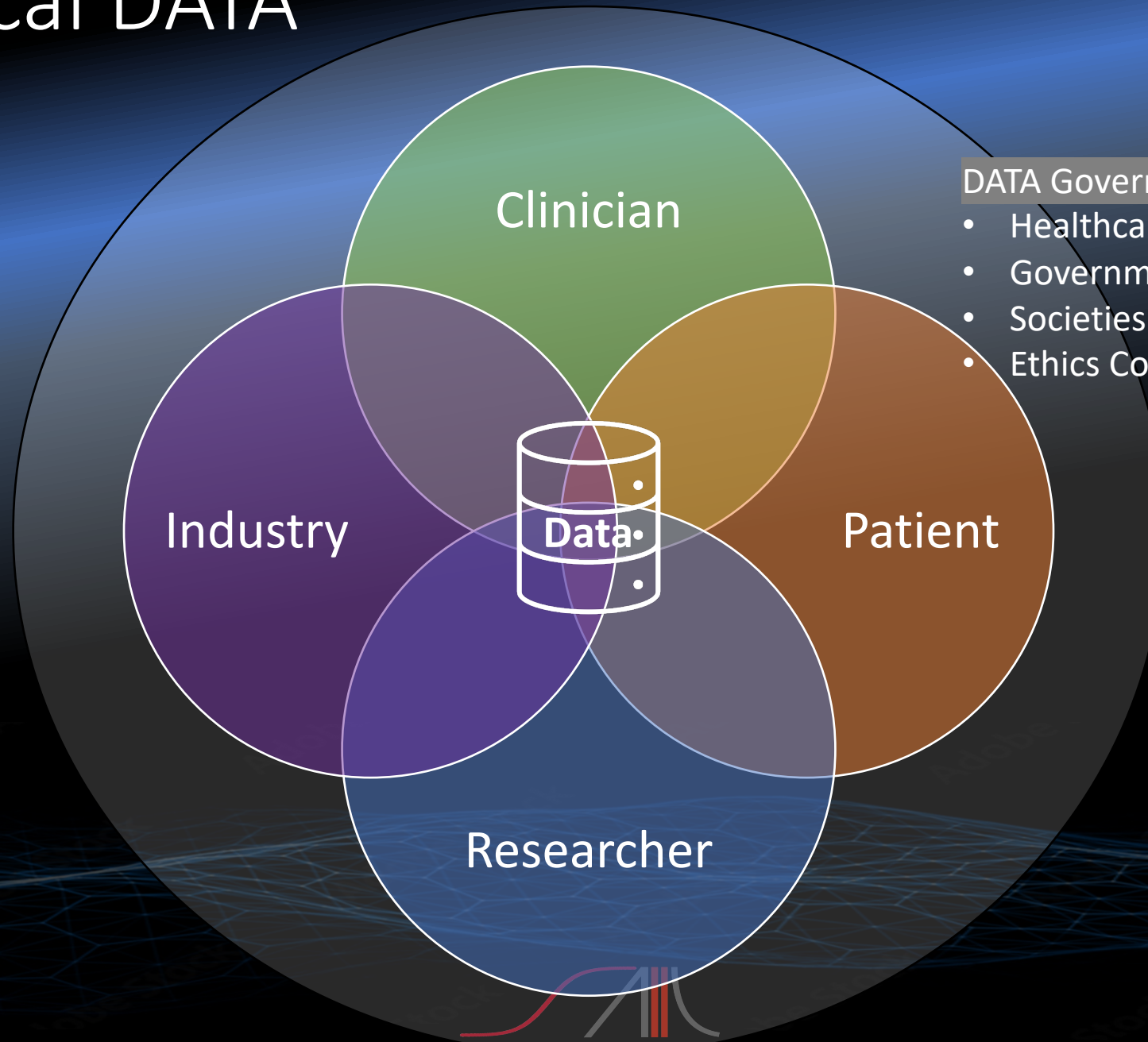




# DATA collection



# Surgical DATA



## DATA Governance, Policies and Oversight

- Healthcare Systems
- Governments
- Societies
- Ethics Committees

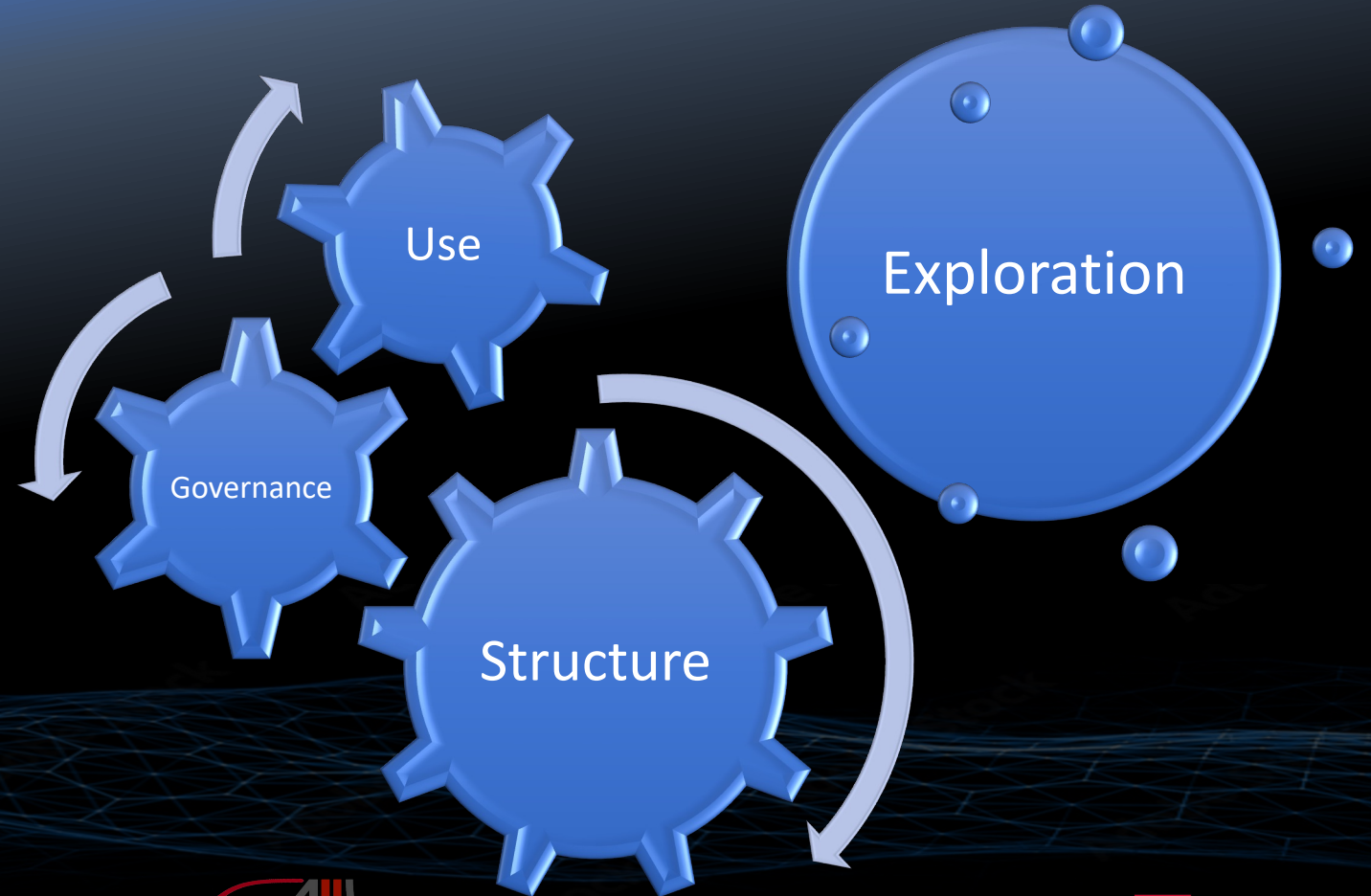


# DATA Use and Structure

Objective: Establish a **framework for video data use in surgery** to improve collaboration and proposed methods to structure the use of surgical video for **clinical use, education, and research** applications.



SAGES Surgical Video Data Summit 2021

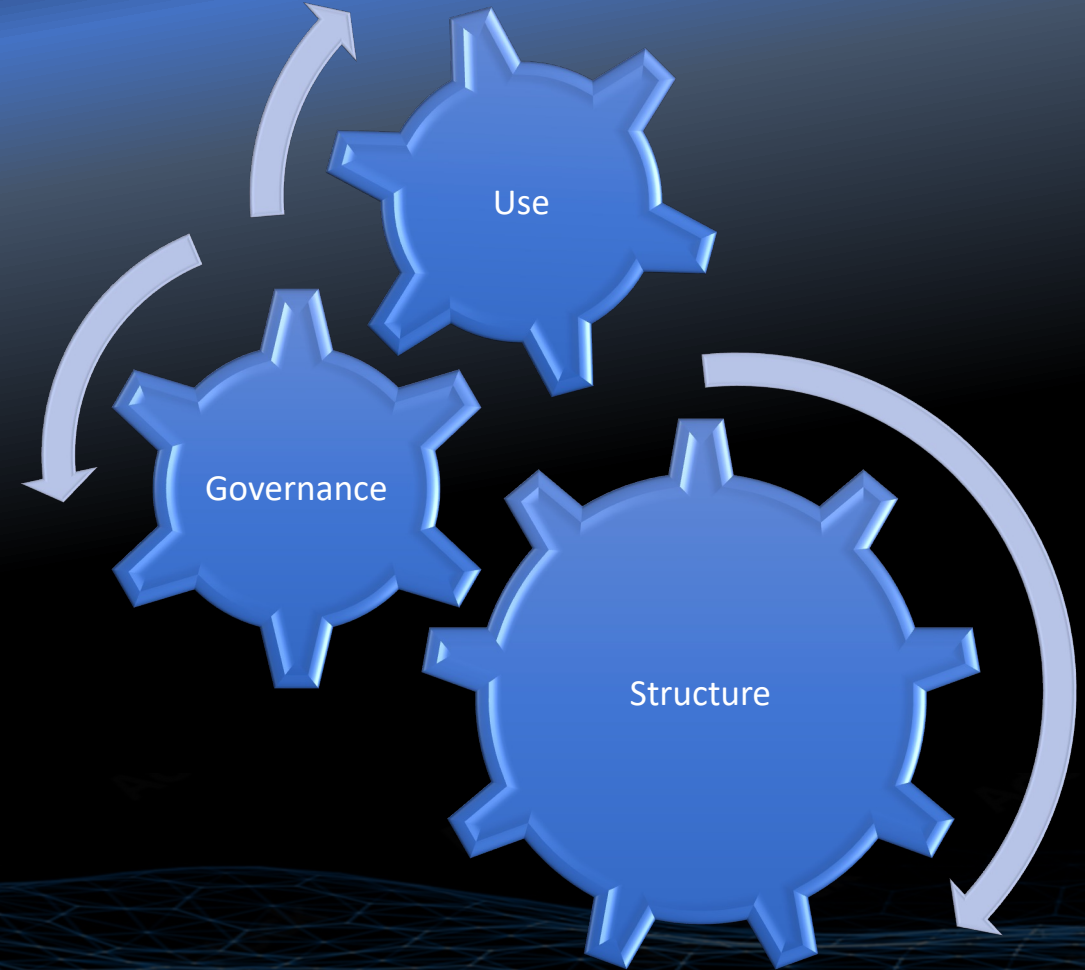


# Foundational work

DATA

Annotation

Policies



# DATA

## Structure

Format

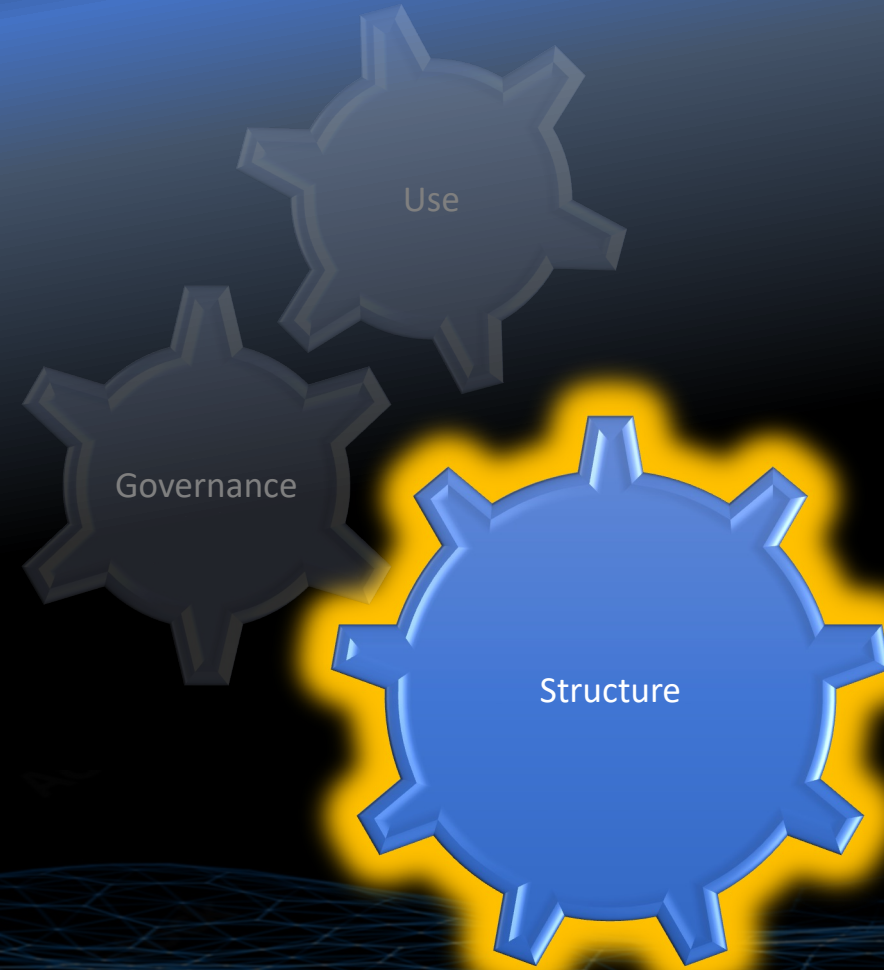
Organization

Management

Modification

Access

Deployment

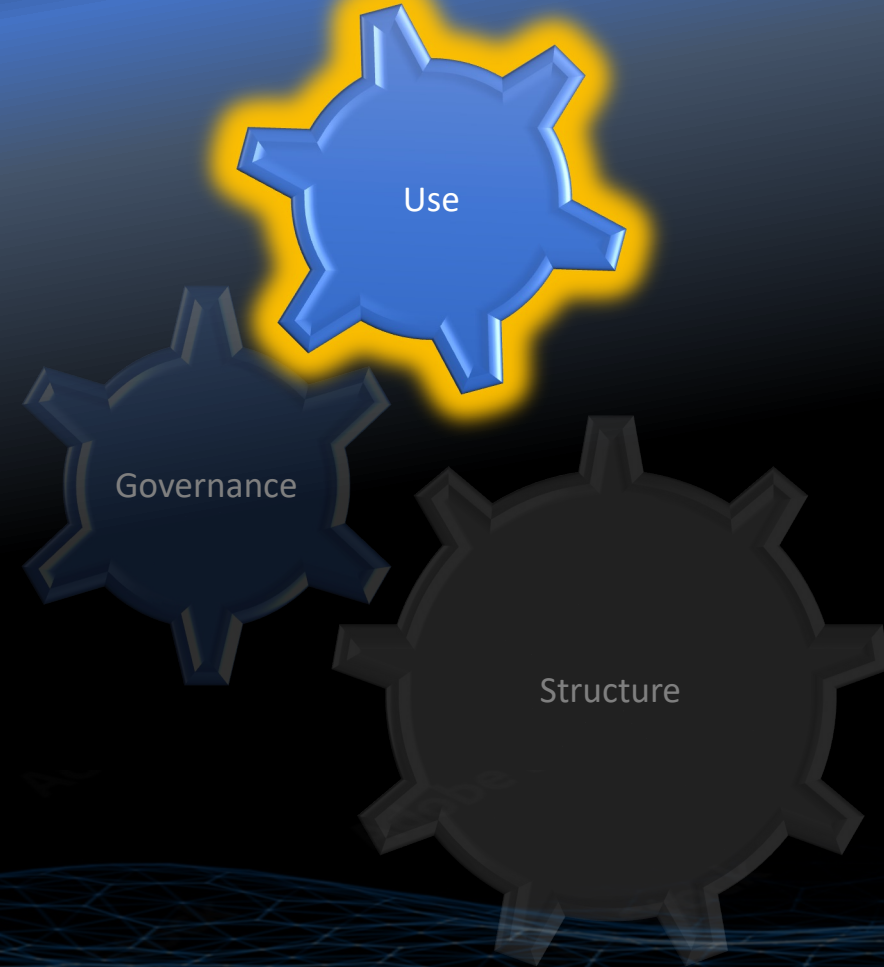




# DATA

Use

Hospitals  
Physicians  
Engineers  
Patients  
Administrators  
Government official  
Insurance companies  
Corporations  
Media





# DATA

## Governance

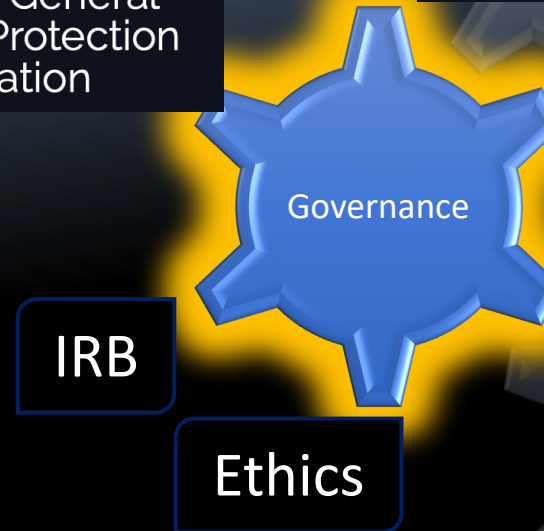
Laws

Policies

Rules

Regulations

Oversight



# Ethics

## PRINCIPLED ARTIFICIAL INTELLIGENCE

A Map of Ethical and Rights-Based Approaches to Principles for AI

Authors: Jessica Fjeld, Nele Achten, Hannah Hillgoss, Adam Nagy, Madhulika Sri Kumar

Designers: Arushi Singh (arushisingh.net) and Melissa Axelrod (melissaaxelrod.com)

### HOW TO READ:

Date, Location  
Document Title  
Actor

### COVERAGE OF THEMES:

Higher Lower

Not referenced

References International Human Rights

Explicitly Adopts Human Rights Framework

The principles within each theme are:

#### Privacy

Privacy by Design  
Recommendation for Data Protection Laws  
Ability to Restrict Processing  
Right to Rectification  
Right to Erasure  
Data Portability  
Recommendation for New Regulations  
Impact Assessment  
Evaluation and Auditing Requirement  
Verifiability and Replicability  
Liability and Legal Responsibility  
Right to Human Oversight  
Recommendation for Automated Decision Making and Automated Decision Making

#### Safety and Security

Safety  
Safety and Reliability

Security

#### Transparency and Explainability

Explainability

Transparency

Open Source Code for Algorithms and AI

Regular Reporting Requirement

Right to Information

Open Procurement (for Government)

Fairness and Non-discrimination

Non-discrimination and the Prevention of Bias

Inclusiveness and Diversity

Representative and High Quality Data

Equality

Human Control of Technology

Human Control of Technology

Human Review of Automated Decision Making

Right to Opt out of Automated Decision Making

Professional Responsibility

Multistakeholder Collaboration

Responsible Design

Consideration of Long Term Effects

Accuracy

Accountability

Promotion of Human Values

Access to Technology

Human Values and Human Flourishing

Access to Technology

Further information on findings and methodology is available in Principled Artificial Intelligence: Mapping Consensus in Ethical and Rights-Based Approaches (Benjamin Klein, 2020) available at [cyber.harvard.edu](https://cyber.harvard.edu).

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KLEIN CENTER  
FOR INTERNET & SOCIETY  
AT HARVARD UNIVERSITY



# Annotation



Spatial



Temporal





# Annotation Framework

## Hierarchical Structure with Expandable Granularity



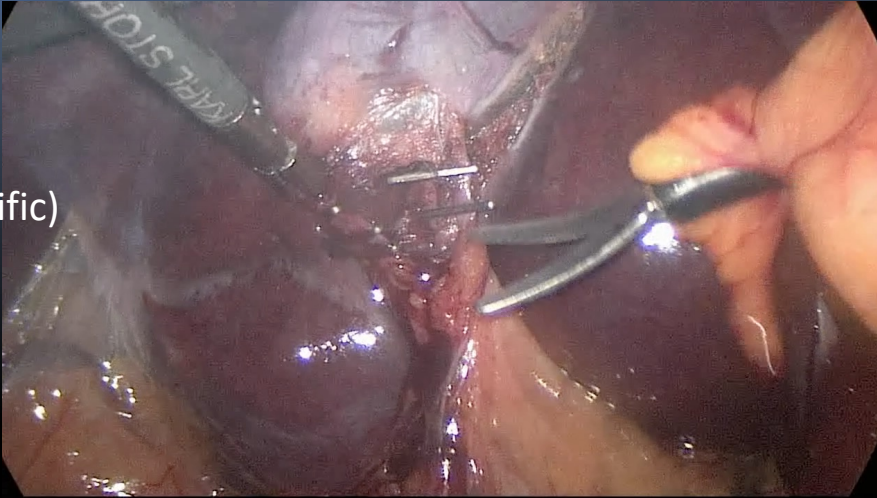
### Temporal Events

Phase (generic)

Step (procedure- specific)

Task (generic)

Action (generic)



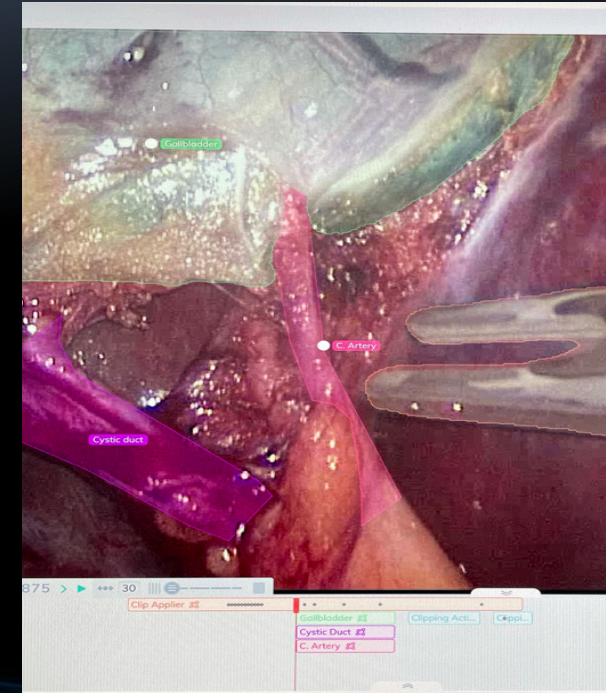
### Spatial Events

Anatomic region

Specific anatomy

General anatomy

Tissue characteristics





# Consensus Recommendations on an Annotation Framework for Surgical Video


Surgical Endoscopy (2021) 35:4918–4929  
<https://doi.org/10.1007/s00464-021-08578-9>



## CONSENSUS STATEMENT



## SAGES consensus recommendations on an annotation framework for surgical video

Ozanan R. Meireles<sup>1</sup> · Guy Rosman<sup>1,2</sup> · Maria S. Altieri<sup>3</sup> · Lawrence Carin<sup>4</sup> · Gregory Hager<sup>5</sup> · Amin Madani<sup>6</sup> · Nicolas Padoy<sup>7,8</sup> · Carla M. Pugh<sup>9</sup> · Patricia Sylla<sup>10</sup> · Thomas M. Ward<sup>1</sup> · Daniel A. Hashimoto<sup>1</sup>  · the SAGES Video Annotation for AI Working Groups

Received: 25 April 2021 / Accepted: 26 May 2021 / Published online: 6 July 2021  
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### Abstract

**Background** The growing interest in analysis of surgical video through machine learning has led to increased research efforts; however, common methods of annotating video data are lacking. There is a need to establish recommendations on the annotation of surgical video data to enable assessment of algorithms and multi-institutional collaboration.

**Methods** Four working groups were formed from a pool of participants that included clinicians, engineers, and data scientists. The working groups were focused on four themes: (1) temporal models, (2) actions and tasks, (3) tissue characteristics and general anatomy, and (4) software and data structure. A modified Delphi process was utilized to create a consensus survey based on suggested recommendations from each of the working groups.

**Results** After three Delphi rounds, consensus was reached on recommendations for annotation within each of these domains. A hierarchy for annotation of temporal events in surgery was established.

**Conclusions** While additional work remains to achieve accepted standards for video annotation in surgery, the consensus recommendations on a general framework for annotation presented here lay the foundation for standardization. This type of framework is critical to enabling diverse datasets, performance benchmarks, and collaboration.

- Spatial annotations
- Temporal annotations
- Software requirements



# Annotation

## Spatial Events

### Anatomic region

(e.g. upper or lower abdomen, pelvis, retroperitoneum, mediastinum, pleural cavity, etc).

### General anatomy

(e.g. veins, arteries, muscle.)

### Specific anatomy

(e.g. liver, gallbladder, stomach, cystic artery, common bile duct, etc.)

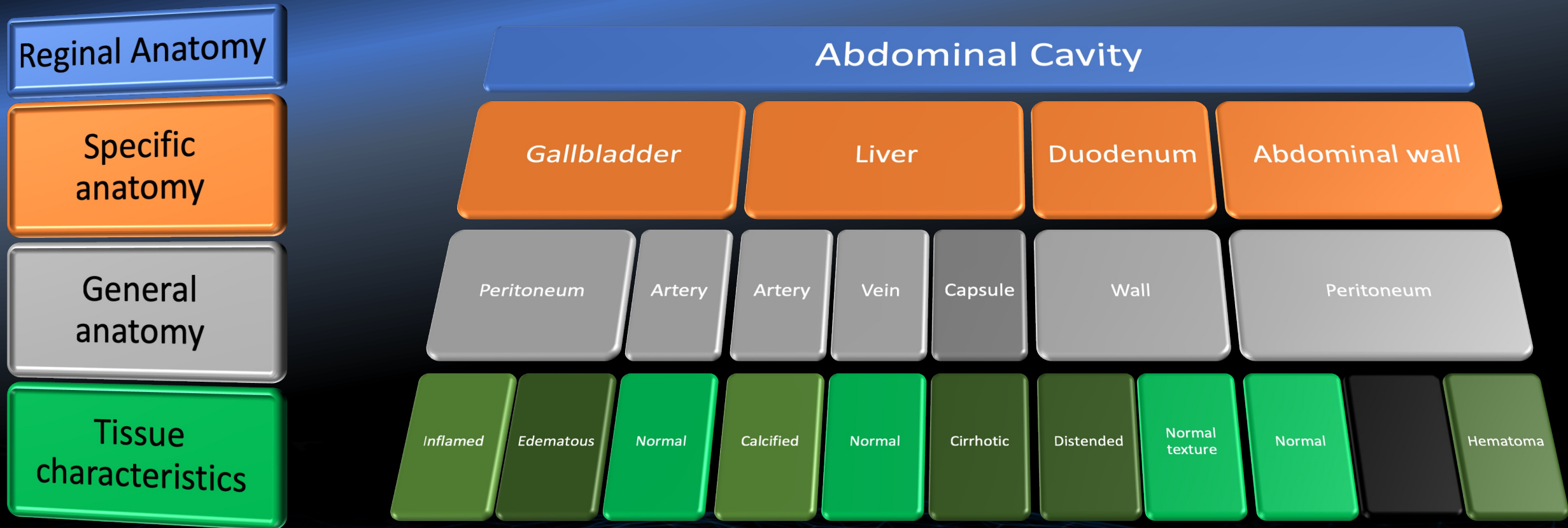
### Tissue characteristics

both normal and abnormal edema, tumors, inflammation, infection, metal deposits, etc.



# Annotation

## Spatial Hierarchy



# Annotation

## Temporal Events

### Phase (generic)

Highest level temporal component of an operation for segmentation purposes; phases are divided into Access, Execution of Surgical Objectives, Closure

### Step (procedure- specific)

Procedure-specific segment to accomplish a clinically meaningful goal, without which the procedure cannot be completed. Steps need not be performed in a specific order. Steps can be interrupted. Steps do not have to be unique to that operation alone (i.e. a step can be present across similar procedures).

### Task (generic)

Sub-component of a step. Composed of a series of actions to accomplish a goal. More than one task must be completed to carry out a step.

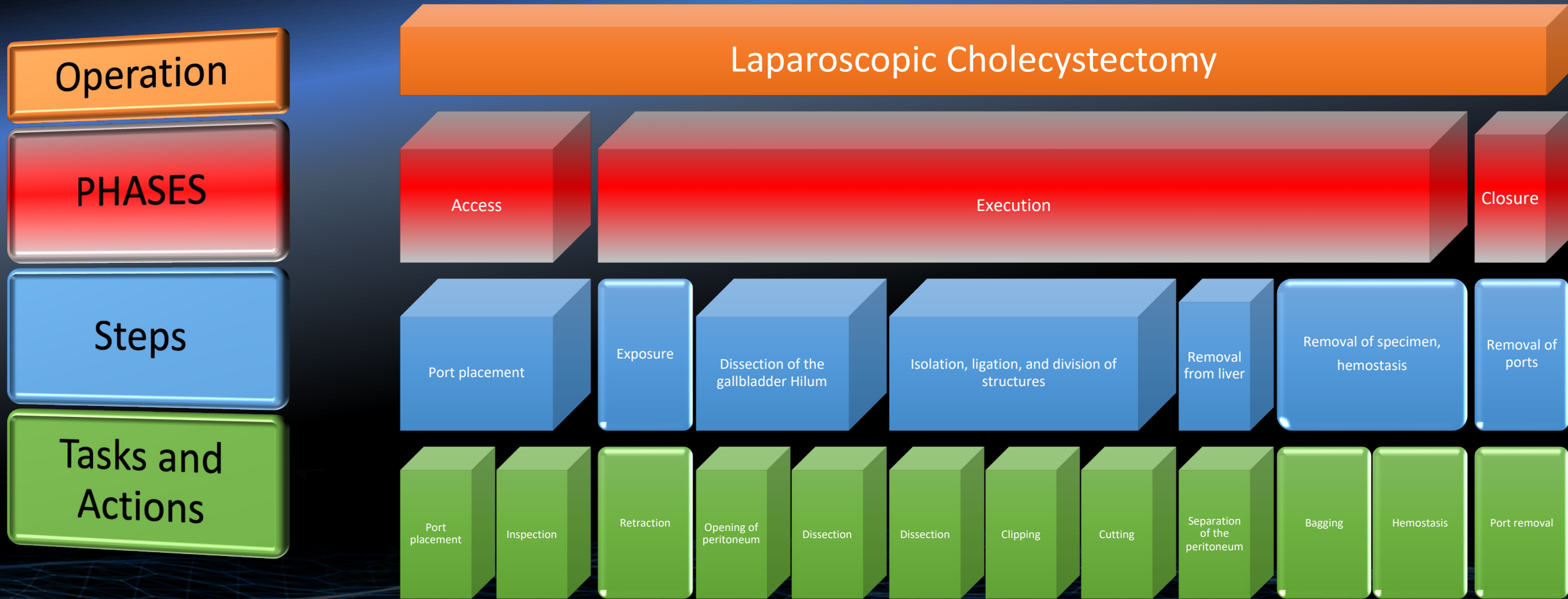
### Action (generic)

A primitive component of a task. A series of actions are required to complete a task. Most often represented by a verb.



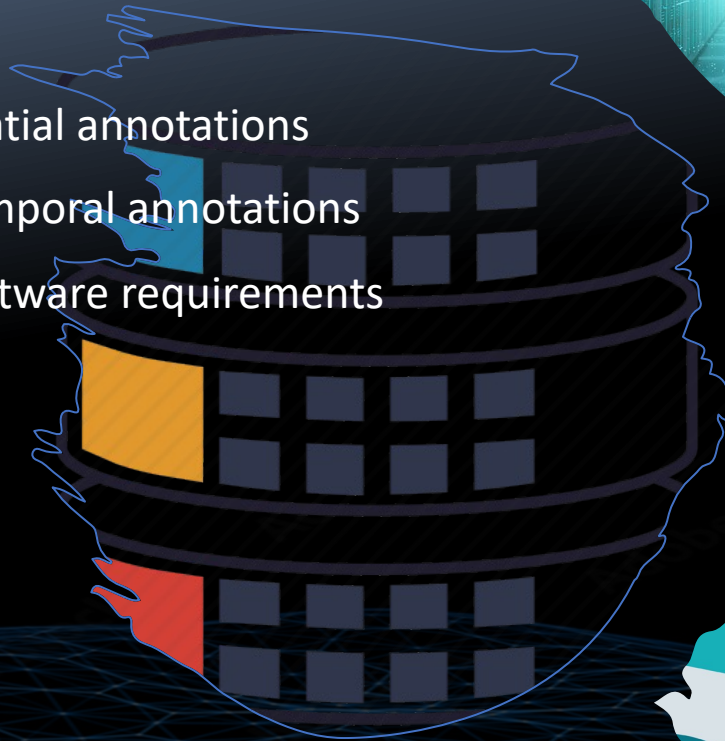
# Annotation

## Temporal Hierarchy



# Surgical Operating System Framework

- Open Access Model to Promote Collaboration
  - Standardization
    - Annotation
    - Data Structure
  - Clear Policies and Regulations
  - Transparency and Oversight
  - Address Ownership Issues
- Spatial annotations
  - Temporal annotations
  - Software requirements



# Scientific efforts

## Clinical Trials



Computer Vision  
Challenges



Multi-institutional  
collaborations



Academia and  
Industry partnership



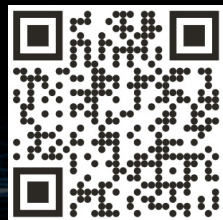
Standards for  
Publications



Validation Studies

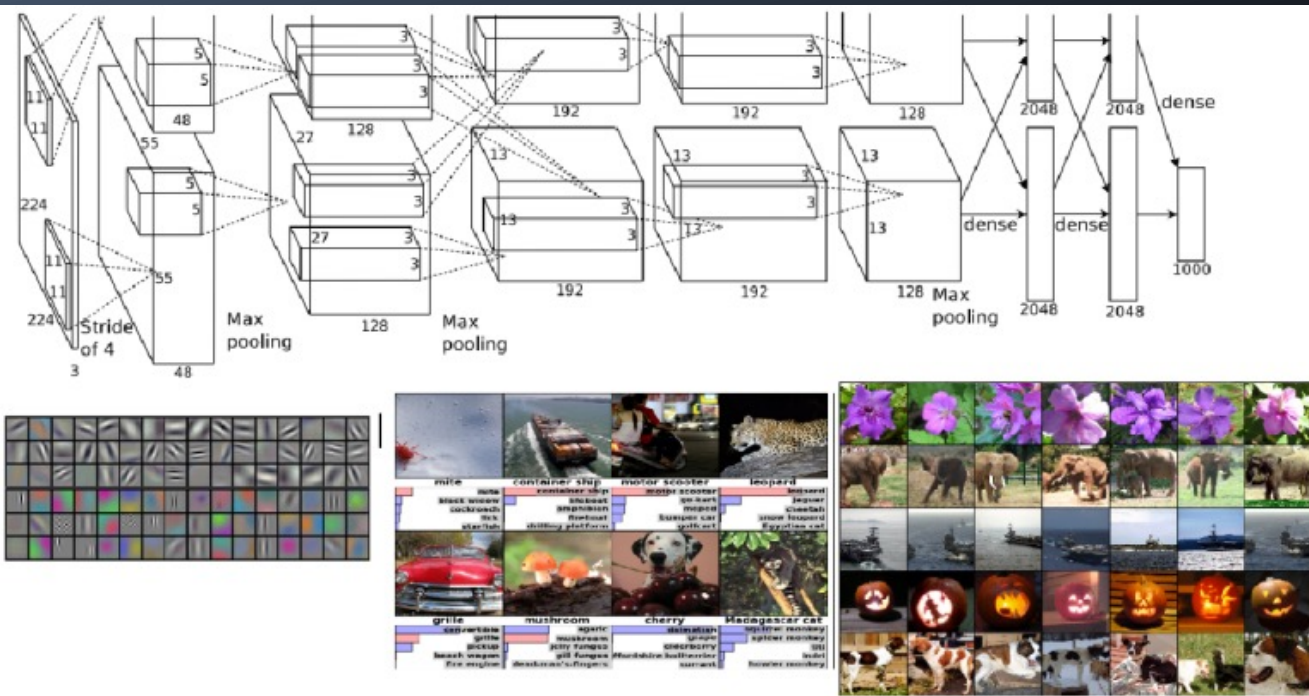
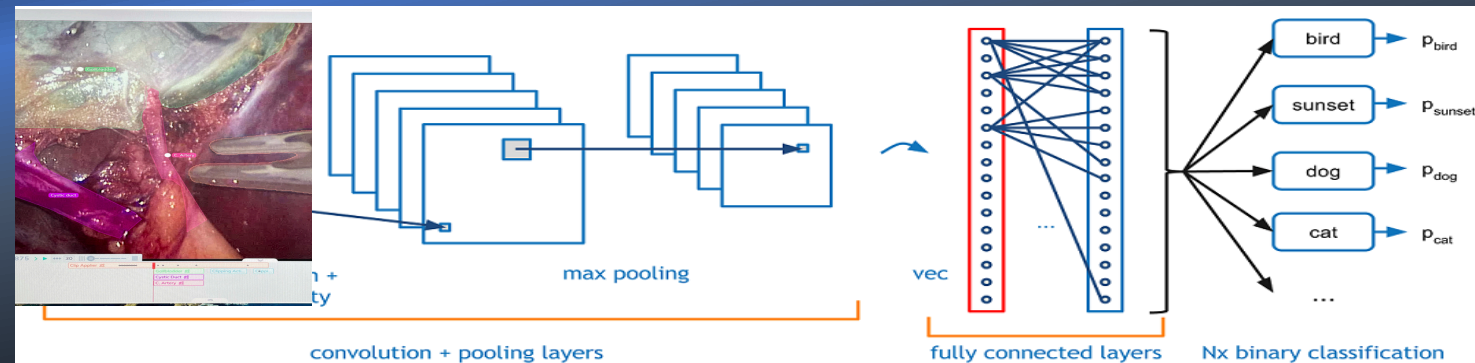


Promote Diversity

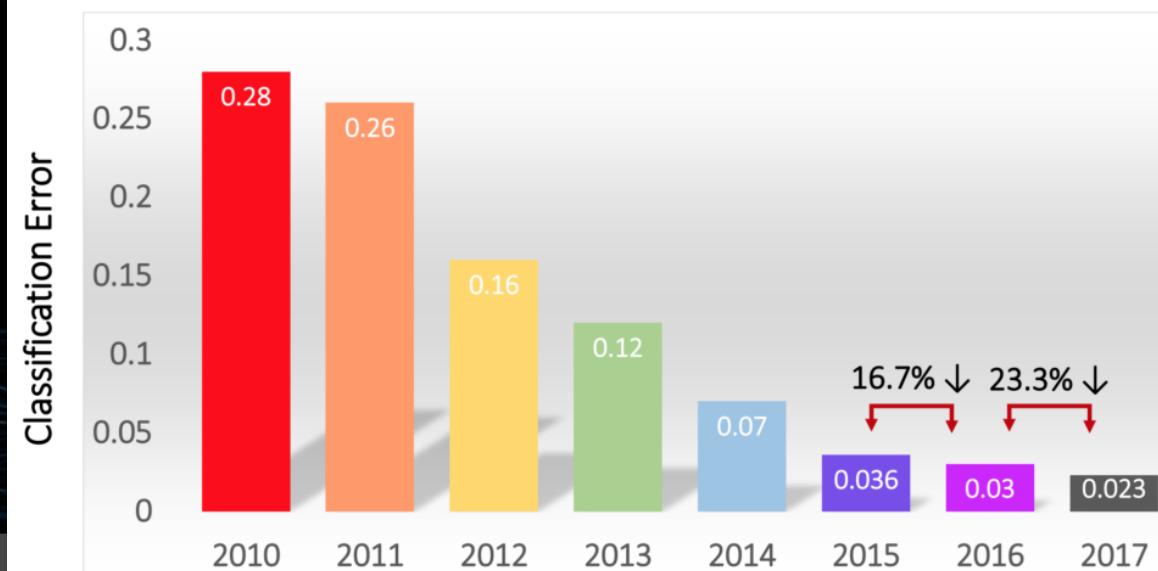




# What is Computer Vision Challenge ?



## Classification Results (CLS)



# Annotation

2020 Innovation Weekend -  
Published Surgical Endoscopy

# DATA

2021 Innovation Weekend



# Governance

2023 - Planning stage



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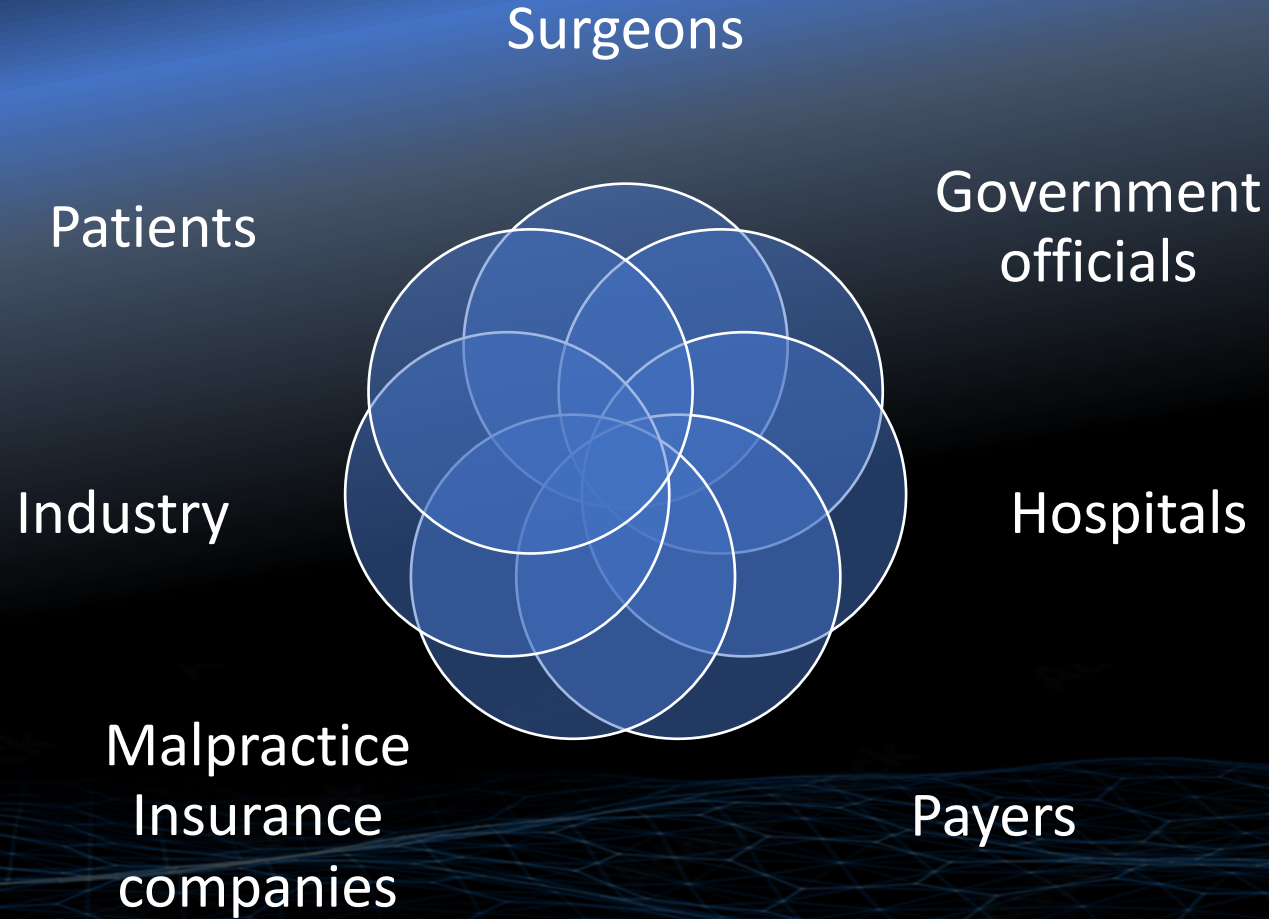


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# Surgical AI Governance

## Regulations, Policies and Oversight



2023



# Education: SAGES Meeting

Dedicated AI Session

2020

2021

2022

2023

2024 – (Proposal for a Postgraduate Course)



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# Research:



## CRITICAL VIEW OF SAFETY CHALLENGE

An initiative of the Society of American Gastrointestinal and Endoscopic Surgeons



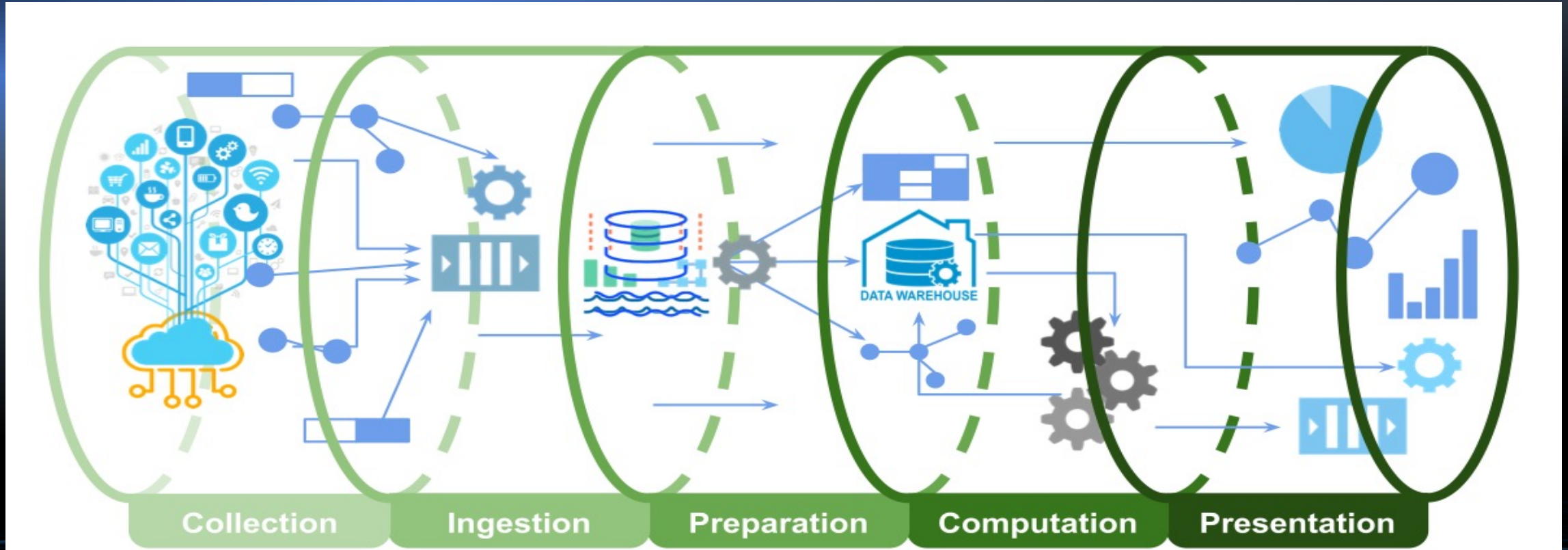
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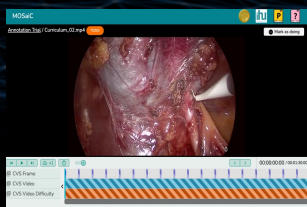
# Design and implementation of the SAGES CVS Challenge Surgical video DATA Pipeline



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VIDEO  
ACQUISITION  
PORTAL



Challenges / SAGES CVS Challenge (CVS-Challenge) / Home



CRITICAL VIEW OF SAFETY (CVS) CHALLENGE

An Initiative of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)

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[The CVS Challenge](#) [News](#) [Data Donation](#) [Annotation](#) [Compete](#) [Sponsorship](#) [The Team](#)  
[2023 Summit \(NEW\)](#) [SAGES](#)



# The Critical View of Safety Challenge

The CVS Challenge Outreach



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A SAGES Initiative



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# The CVS Challenge Outreach

Series1

1

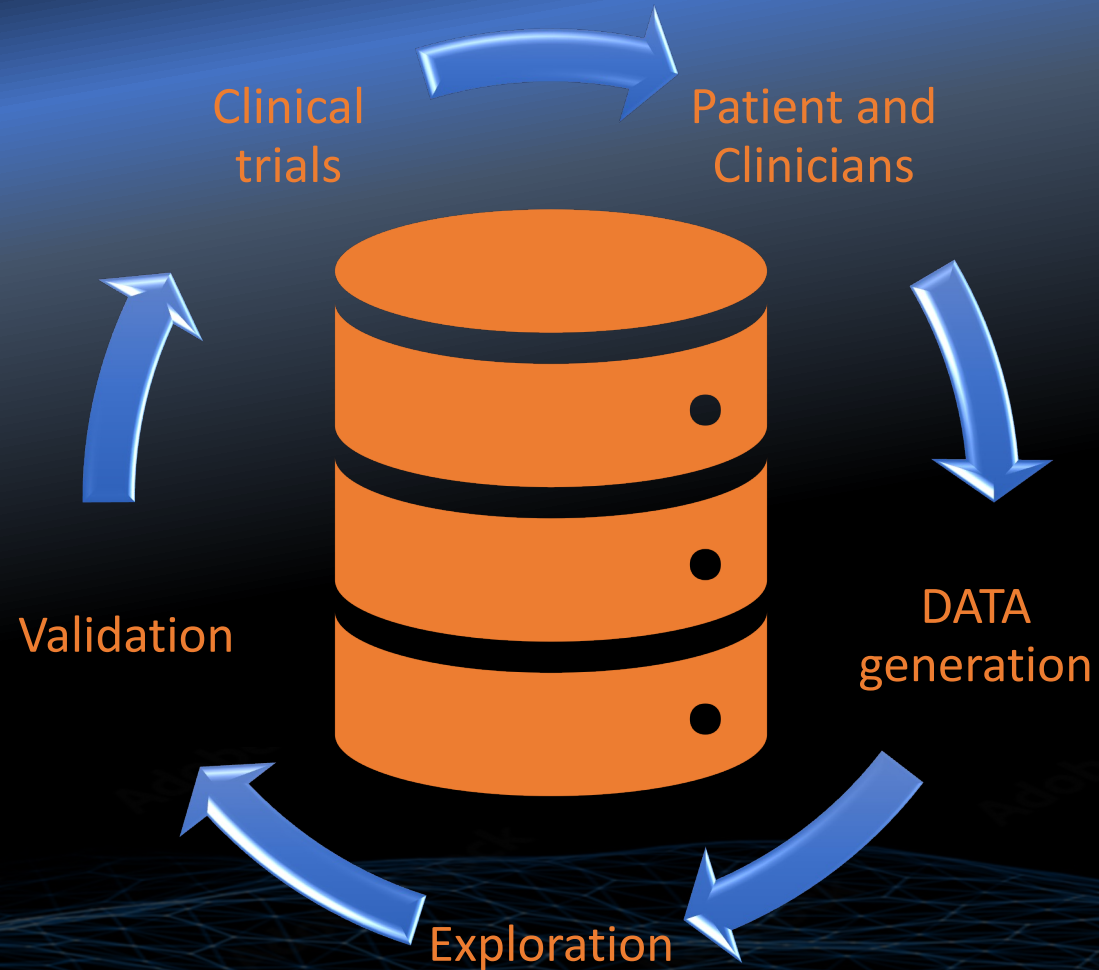


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# DATA Lifecycle







# Thank you !

GET INVOLVED

[www.SAILL.org](http://www.SAILL.org)

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