ATHENAIS

ARTIFICIAL INTELLIGENCE SYSTEMS

Hyper Optimization

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Introduction

Why Athenais was founded in 2019?

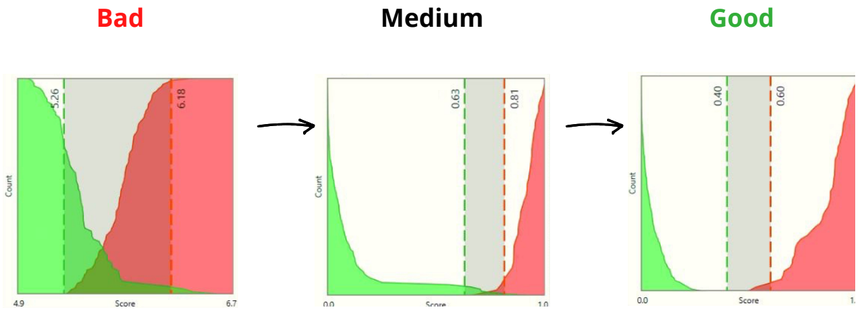
Low-Cost Inspection Station: AIS3020 / AIS4030
Automated inspections systems were way too expensive for low/mid volume applications
Automated Microscope with X/Y stage are too rigid for customization and working area was too small

Solution On very robust and low cost ISEL mainframe, develop an Automated Inspection station with Autofocus, Auto alignment and client/server SW for optical control: Vidi, Vision Pro, Tensor Flow, OpenCV

Hyper Optimization Software:
- Every Cognex Vidi project was taking months to be released to production…
  …when it was successful….
- Projects fail rate was above 50%….
- How are you confident to release to production a Cognex Vidi run time where you have spent month to stabilize, if it starts drifting will it takes month again to stabilize…
- How could you forecast cost/resources needed per project

Solution Why letting a human being setting parameters of an AI,
Let's use an AI to set AI parameters and give you the best achievable results with your given image set.
Target less than 5 hours of Engineer time per Vidi Core !!!

Hyper Optimisation Athenais Core training

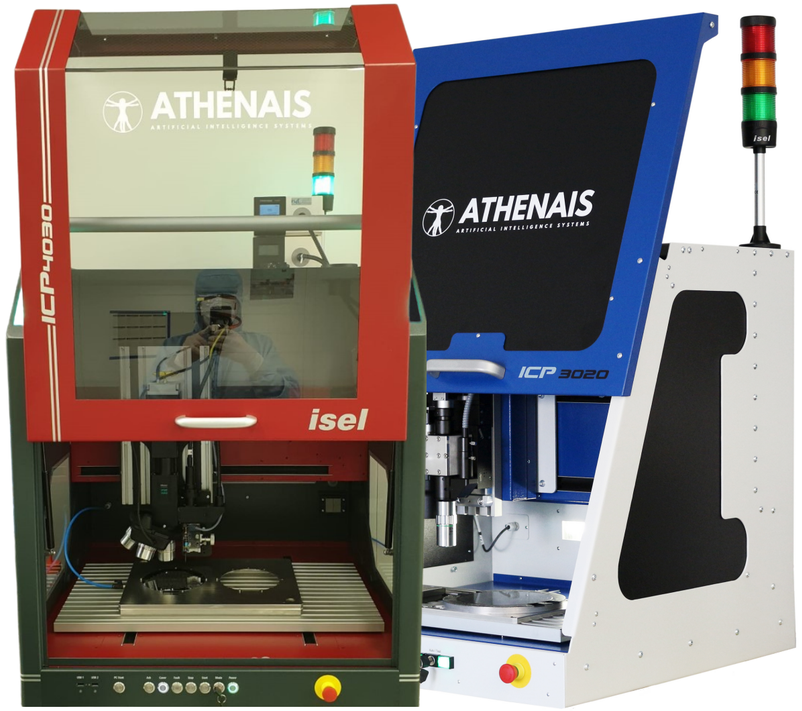


Athenais is now active in:

- Electronics
- Watchmaking
- Medical
- Aeronautics and defense

Test bench: AIS3020 / AIS4030 Automatic Optical Inspection stations

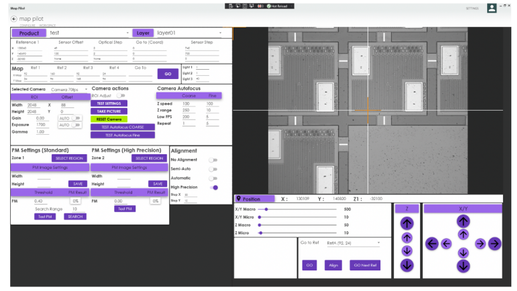
Ready to deploy AOI with deep learning defect inspection (Cognex Vidi / AWS / Tensor Flow)



Automatic Inspection

Programmable Pattern recognition
Feature measurement (size/location/density) with Cognex Vision Pro or OpenCV
Defect inspection with Deep Learning capability, Cognex Vidi, AWS Tensor flow or 3rd party cores

Athenais MapPilot©



Automatic alignment with pattern recognition
Autofocus and SW control of illumination
Automatic picture acquisition, resizing, consolidation
Pixel to micron calibration
Inspection area user defined according to wafer map
Recipe creation interface
Results database for panel/wafer/mask traceability
Client server architecture to operate several equipment in parallel

Athenais MapInspect©

Post Inspection software for picture review/tagging
Multiple reviewer for defect benchmark
Map/defect review and tagging

Athenais Hyper Optimization:

Automatic search of best Vidi Parameter set with a powerful AI
Less than 5h of engineer time per project
Automatically show what the best Vidi core achievable with selected picture

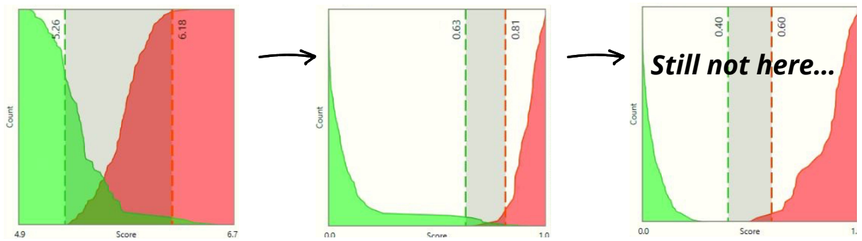
What's an ideal AOI project?

Mfg. Eng	Deploy acquisition system	Data acquisition	Review Sorting Results		Review and decide FP/FN criteria		Install Run Time and functional check on Golden samples	Safe Launch: “dual command”: Inspection of production but no Decision	Release Process Qualification report, initiate PCN
ML / Data Scientist				Upload Data and start Vidi parameter search	**>90% accuracy reached, but pictures sorting issues FP/FN**	**Finalize Vidi parameter search and release a one Run Time**	Review performances results	Follow up on core performances	Final Report of core stability
QA			Review Sorting Results		Review and decide FP/FN criteria		Organize MSA: GR&R	Safe launch: process stability	Release PCN
Ops		Data acquisition		Multi Operator Img sorting: Good/Bad			Multi Batches, multi runs inspection	Safe launch: Dual Inspection of selected material	Update Routings and Operate

Real Life: What will fail here?

- Reaching >90% distribution was “fast”, we only spent 20hours….
- It looks like that image classification isn’t optimum
- Let’s change images flag and Vidi parameters
- … keep going …
- + 1 month and we are still at Medium performances
- … keep going …

Bad → **Medium** → **Good**



Why using an AI Hyper Optimization system?

Mfg. Eng	Deploy acquisition system	Data acquisition	Review Sorting Results		Review and decide FP/FN criteria		Install Run Time and functional check on Golden samples	Safe Launch: “dual command”: Inspection of production but no Decision	Release Process Qualification report, initiate PCN
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Real Life AOI Vidi Project Workflow

We have >10’000 pictures but sorting it will take months…
We finally have our Good/Bad but how do I select my Training set
Painful data extraction from Vidi: multi run statistical data, FP/FN sorting
We have worked 3 months, completed +50 vidi runs but
we are still below our targets….
We have a core, matching initial criteria, but is it the best one to avoid long term drift/new update?

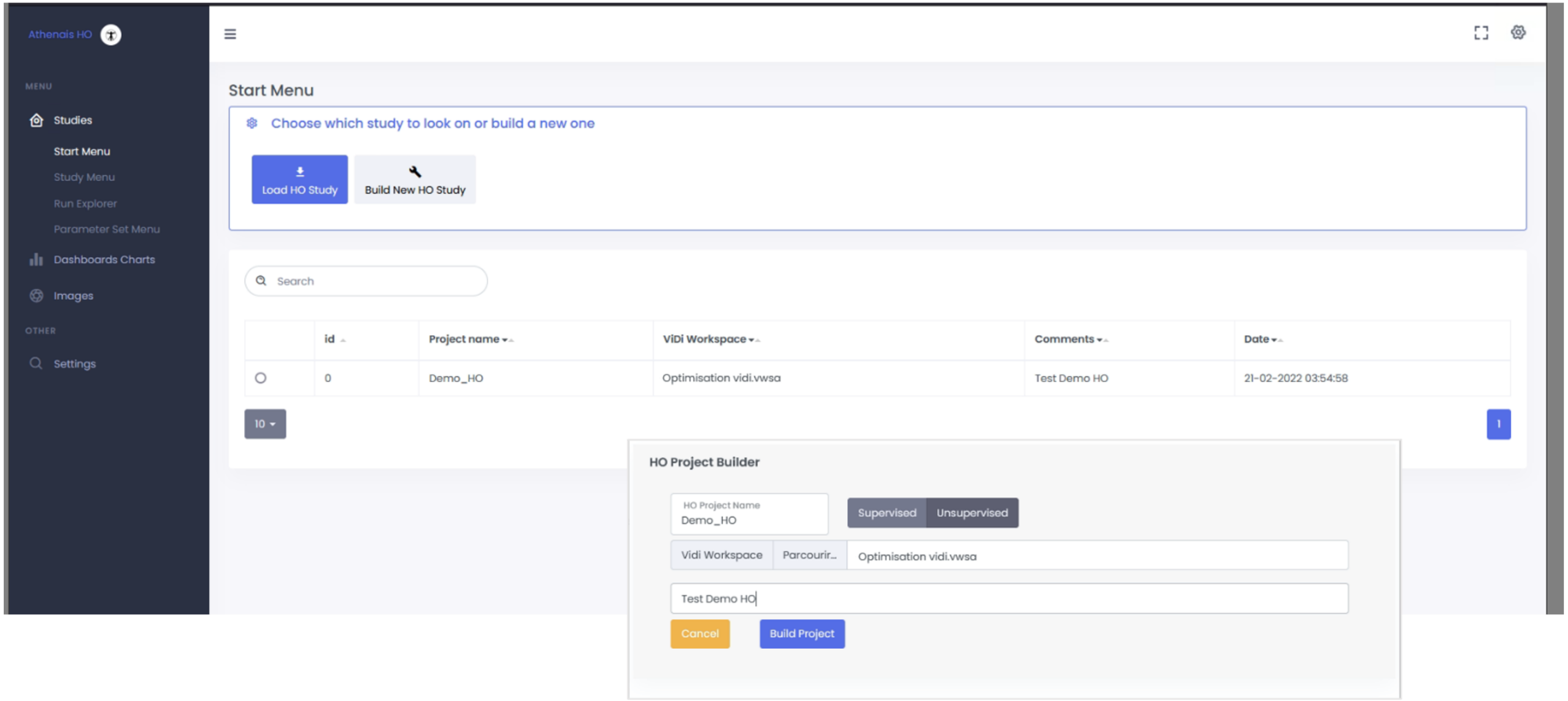
Hyper Optimization Vidi Project Workflow

Use Map Inspect to have a goo image Good/Bad sorting
Launch Athenais HO, select image folders (Good/Bad), select initial parameter set range, define your searching dimension à 30 minutes and then start à 72h GPU time later à review your results:
Athenais HO is showing the best achievable core performance with given image set
Review your image set: FP/FN à 2hours à reduce your parameter search range (10 minutes) à start and approx. 72h GPU time later à Best Core available

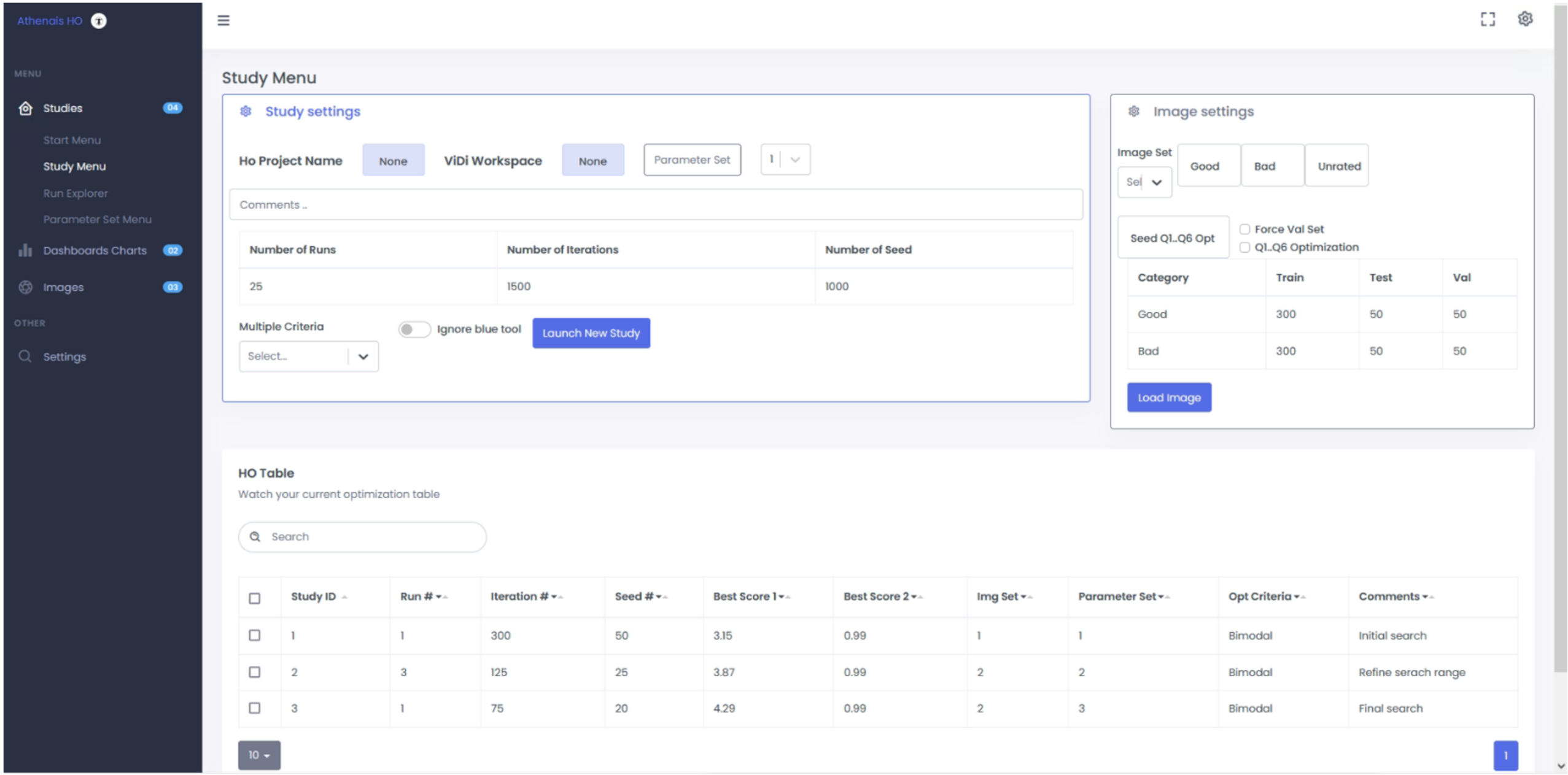
With Athenais Hyper Optimization: Control your development cost, and speed up your production release

- Low Risk on new project: Engineer time remains under control and low!
- Best achievable core is found automatically
- Quick reaction time to decide to improve your vision set-up
- Quick reaction time to correct a released core in production if drifting

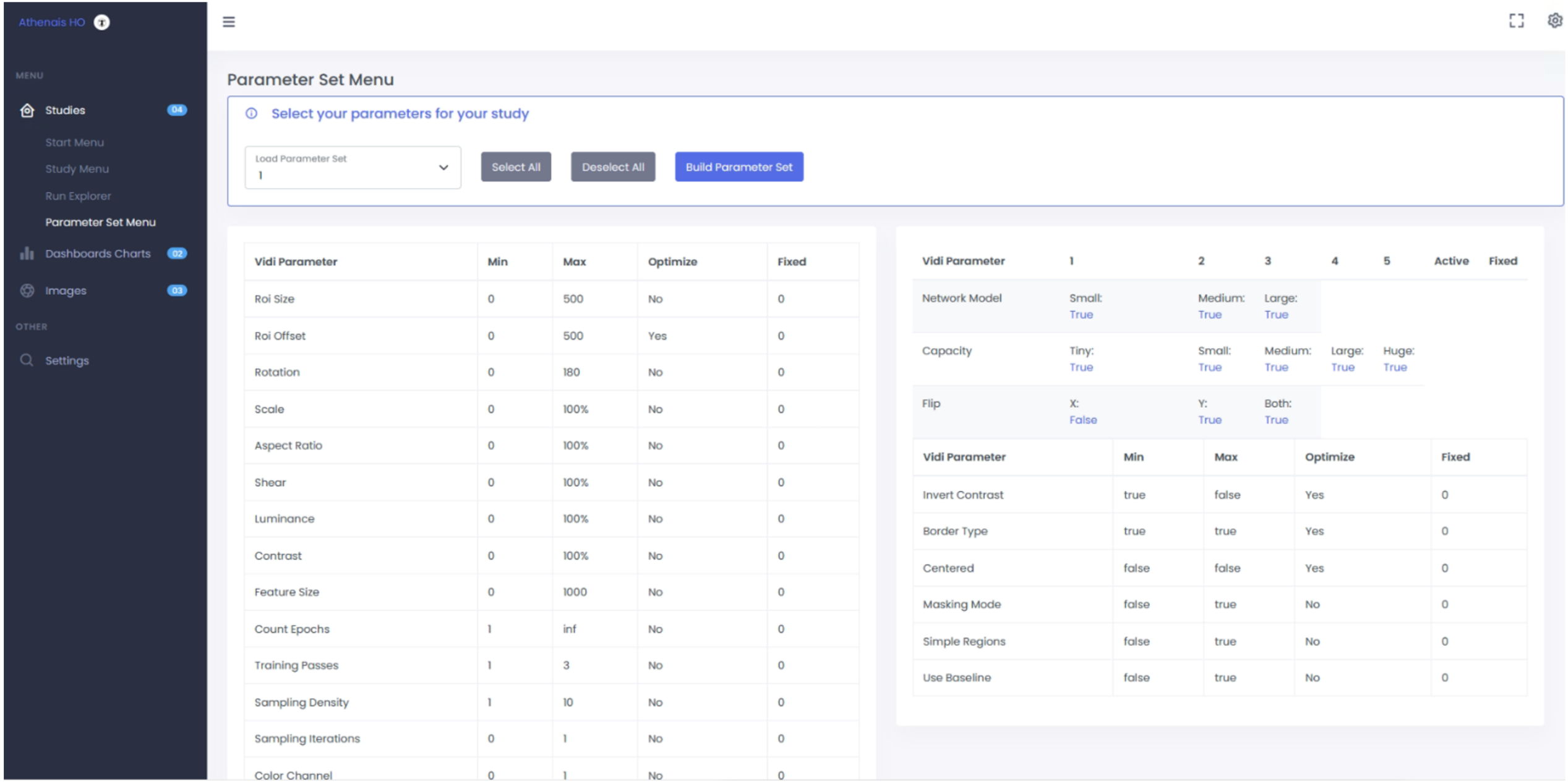
Step 0: Define and Select you Vidi Workspace and Build a new HO study



Step 1: Define your study parameters



Step 2: Define your Vidi parameters search range

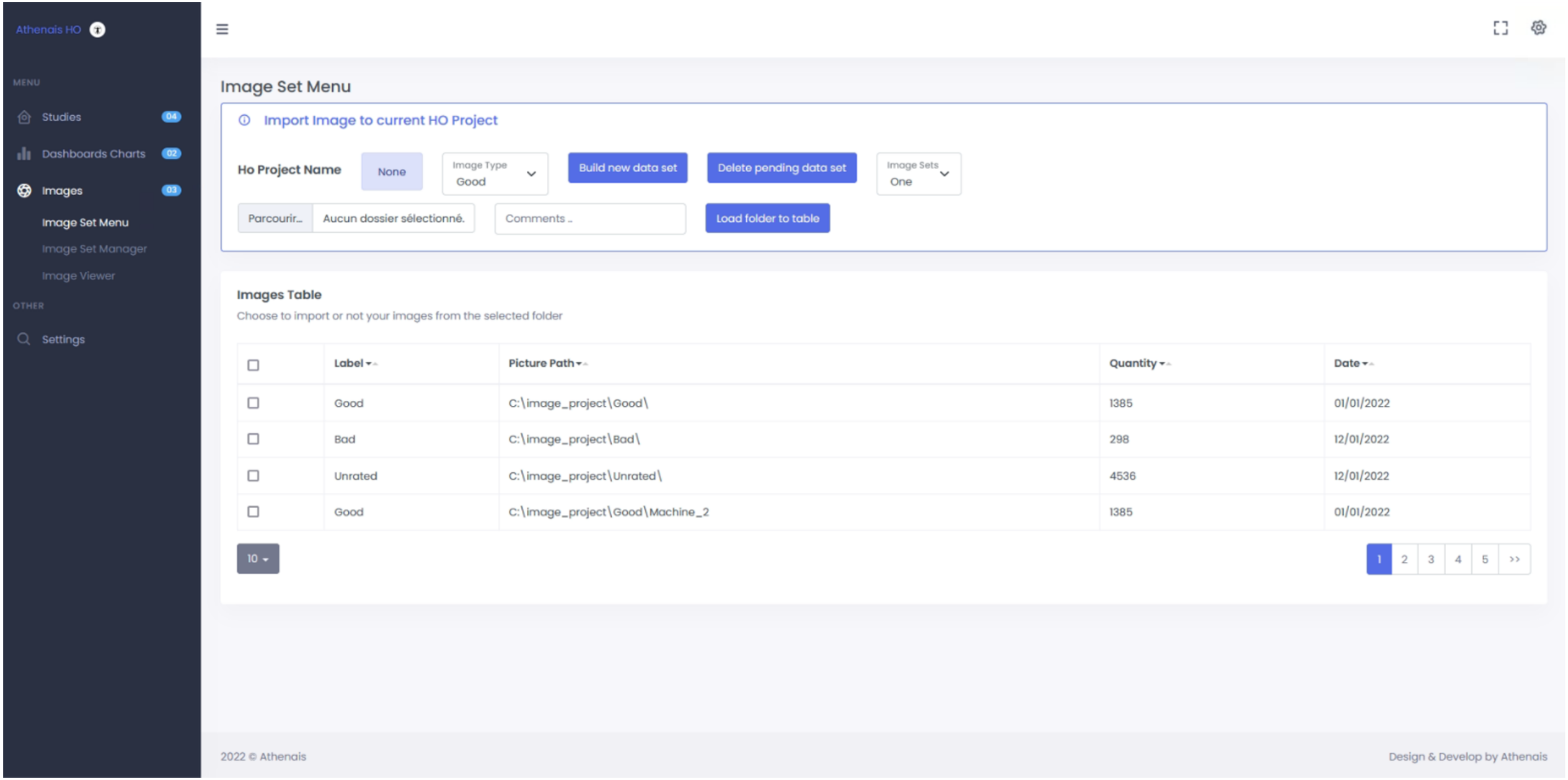


Vidi Parameter	Min	Max	Optimize	Fixed
Roi Size	0	500	No	0
Roi Offset	0	500	Yes	0
Rotation	0	180	No	0
Scale	0	100%	No	0
Aspect Ratio	0	100%	No	0
Shear	0	100%	No	0
Luminance	0	100%	No	0
Contrast	0	100%	No	0
Feature Size	0	1000	No	0
Count Epochs	1	inf	No	0
Training Passes	1	3	No	0
Sampling Density	1	10	No	0
Sampling Iterations	0	1	No	0
Color Channel	0	1	No	0

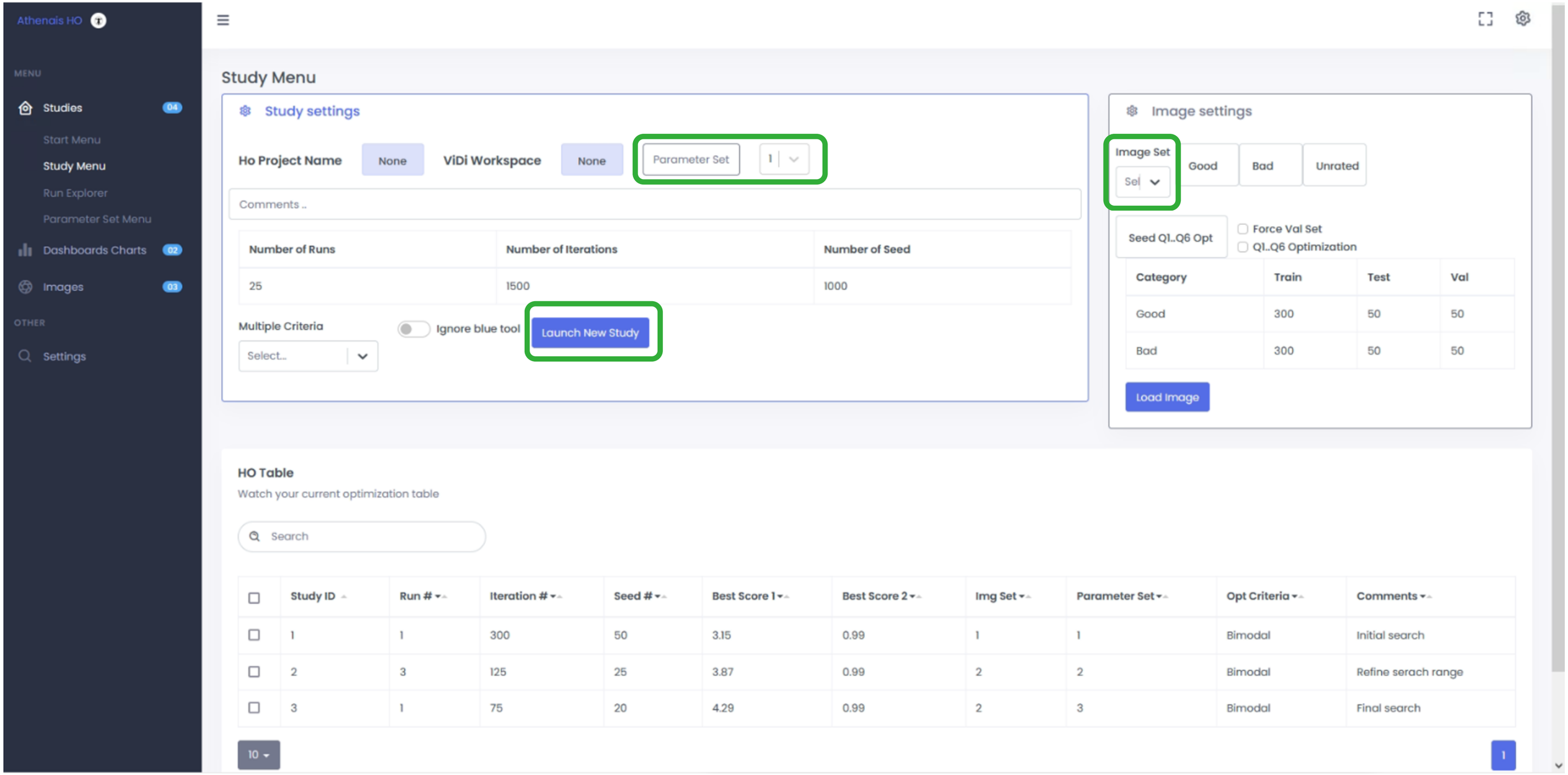
Vidi Parameter	1	2	3	4	5	Active	Fixed
Network Model	Small: True	Medium: True	Large: True				
Capacity	Tiny: True	Small: True	Medium: True	Large: True	Huge: True		
Flip	X: False	Y: True	Both: True				

Vidi Parameter	Min	Max	Optimize	Fixed
Invert Contrast	true	false	Yes	0
Border Type	true	true	Yes	0
Centered	false	false	Yes	0
Masking Mode	false	true	No	0
Simple Regions	false	true	No	0
Use Baseline	false	true	No	0

Step 3: Select your image set (Good/Bad/Unrated)



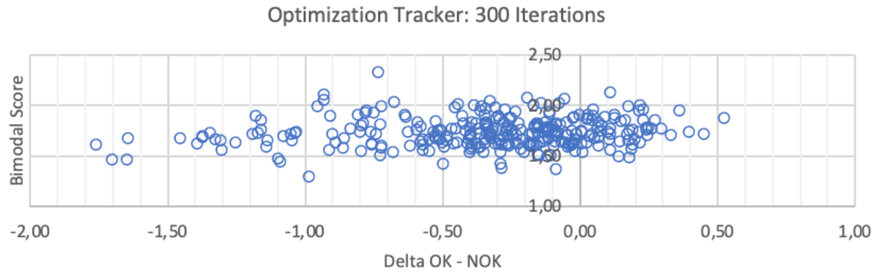
Step 4: Load your Vidi Parameter set and Image set - Launch study



Step 5: HO is running: have a look on results

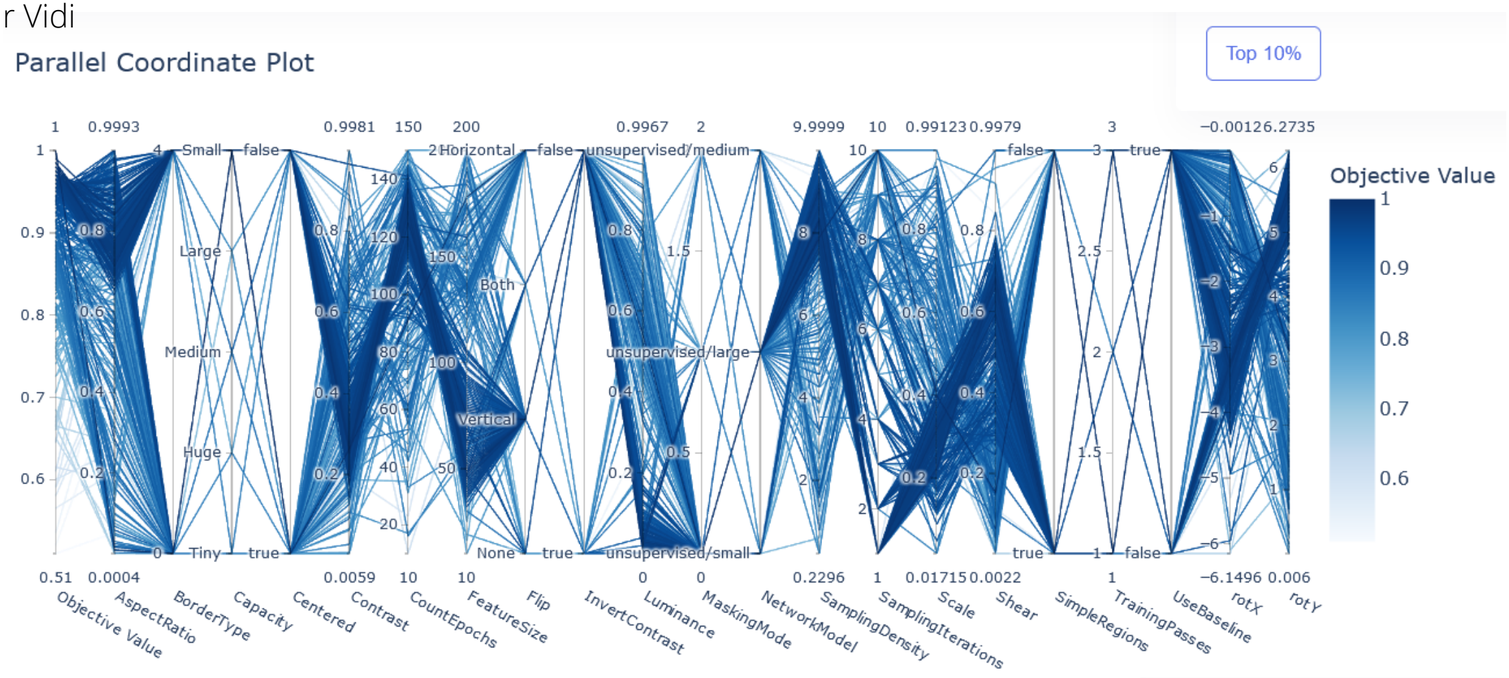
Optimization Tracker

- Look at best performance achieved for your selected criteria
- Real time monitoring of AI search



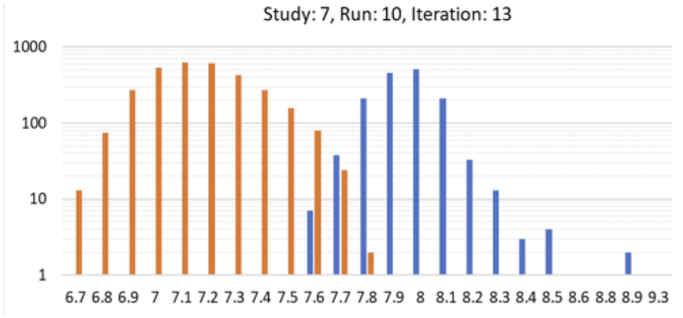
Best Parameter Set

- Once initial study is completed review and refine your Vidi Parameter set
- Select you 10% best runs/iterations
- Spider chart shows Vidi parameter range
- Build a new parameter set for next HO runs

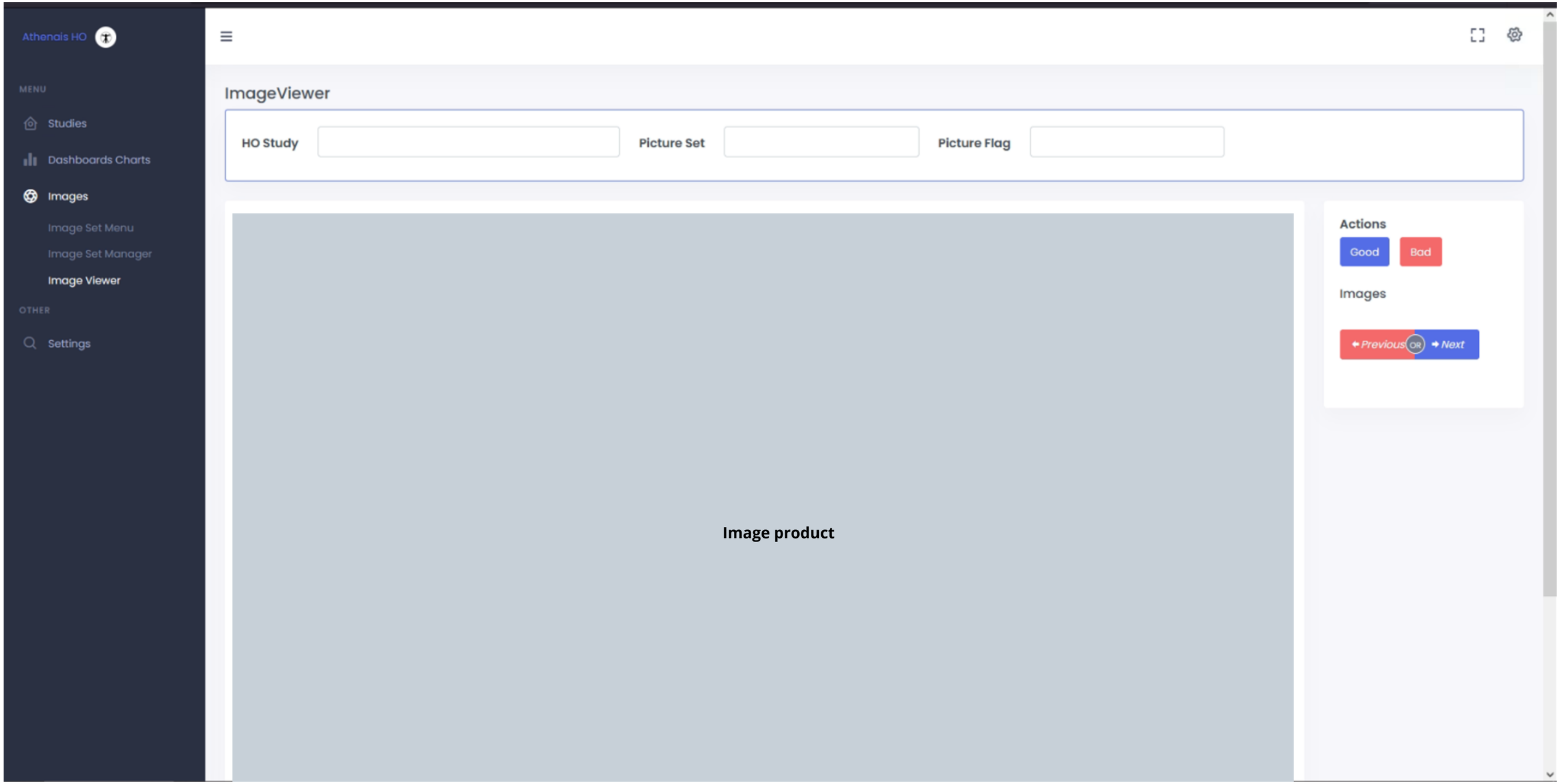


Histogram Image score distribution

- Identify and review your image FP FN and adjust your image set
- Switch flag of your questionable image
- Review Image with Image Viewer and decide
- Save and build a new image set for next HO runs



Step 6: HO study Completed: Review your FP/FN images and decide



Step 7: HO study Completed : Spider Chart: Shows optimum Vidi Parameter Ranges

Athenais HO

MENU

- Studies
- Dashboards Charts
  - Spider
  - Histogram
  - EDF
  - Intermediate Values
  - OptHistory
  - Parameter Importance
  - Pareto Front
  - Slice
- Images

OTHER

- Settings

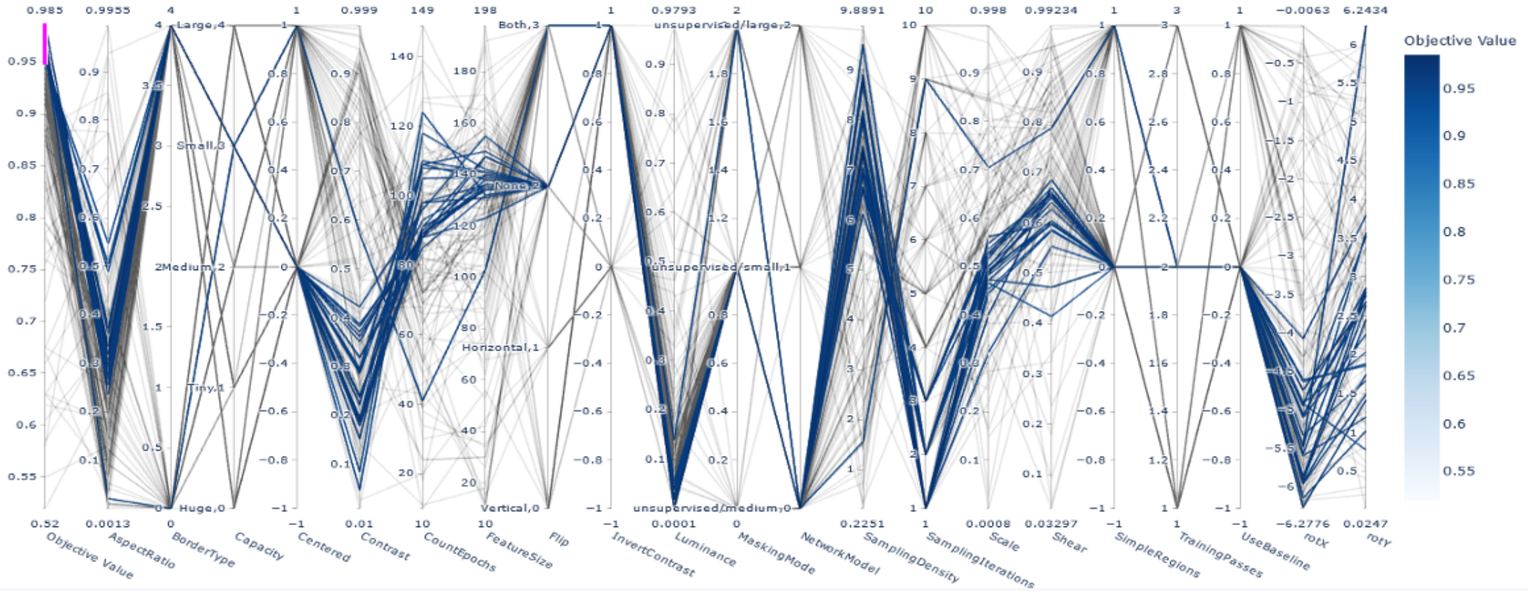
SpiderChart

Actions

Study ID: 1 | Run: All | Iterations: All | Score TH: 0.95 | ViDi Range:

Chart

Visualize hyperparameters



Actions

Here you can plot and manipulate your spider graph

Top 10%

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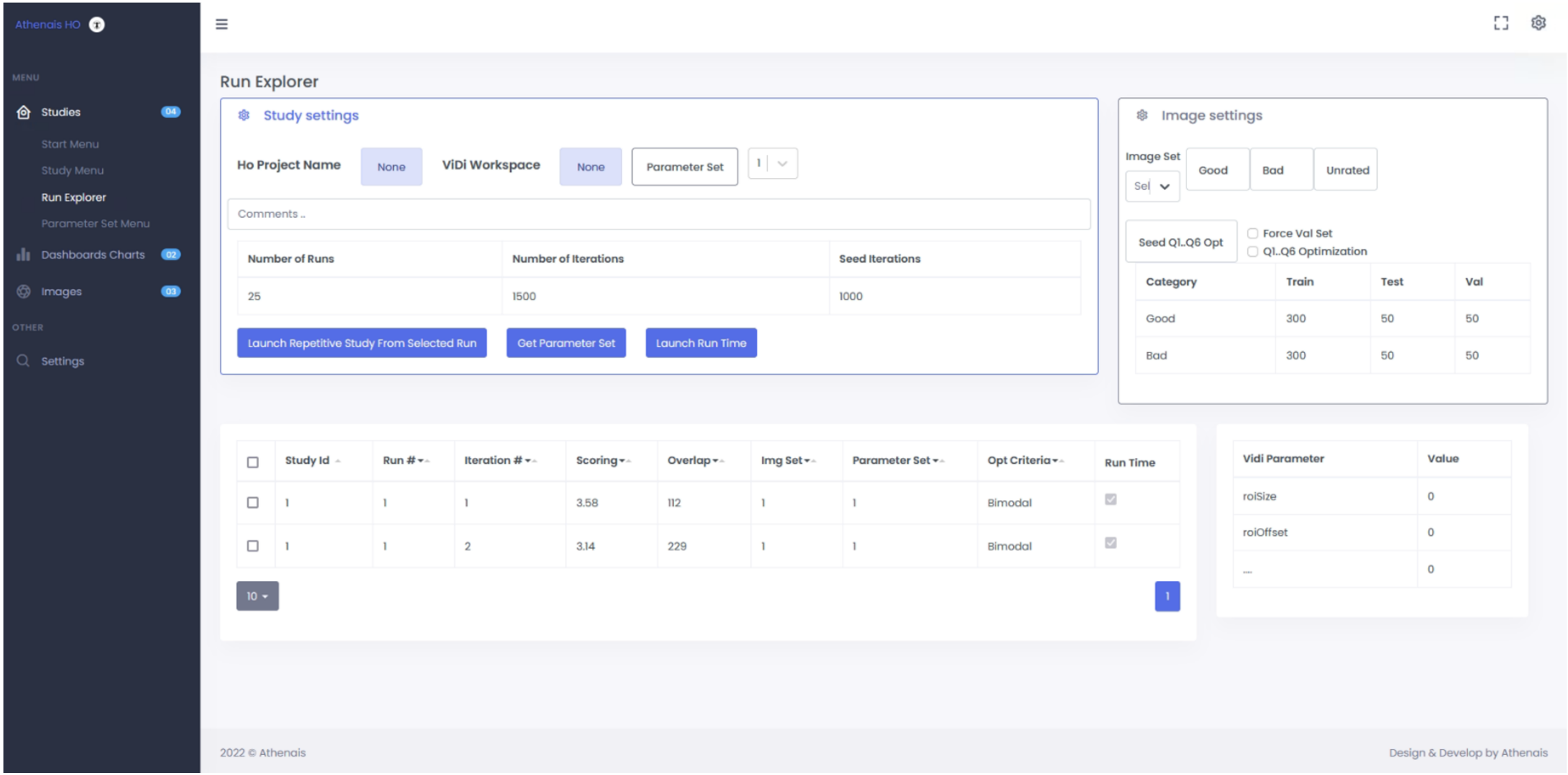
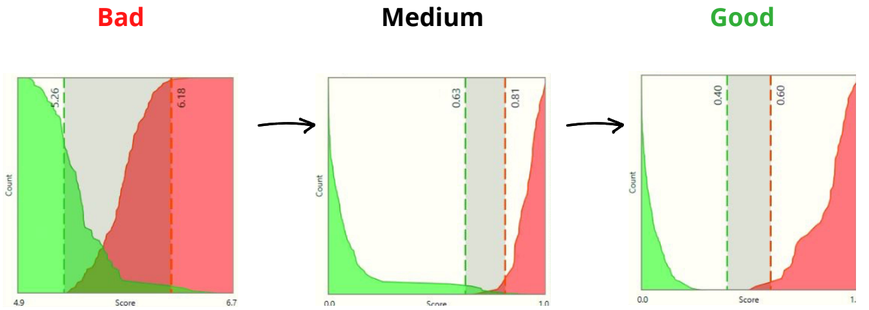
Design & Develop by Athenais

Step 8: Update your Vidi Parameter set and Image set - Launch a new study



Step 9: Your done!

Conclusion:
With less than a few hours of engineer time you have now:
The best achievable results with your image set



Using Athenais HO provides :
Cost Benefit; Low Risk on new project, Engineer time remains under control and low!
Reliable performance; Best achievable core is found automatically
Quick reaction time to decide to improve your vision set-up performances
Quick reaction time to correct a released core in production if drifting

With Athenais Hyper Optimization,
control your development cost, and speed up your production release

Give us your Pictures, we'll compute the best core
Or
DOY: Rent Hyper Optimization when you need it

Price list

	OBJECT	CHF Price VAT Excluded Starting at
	Pre-study	6'500
Soft Hyper optimization	Rental Subscription 1st Month Monthly subscription thereafter	 5'200 2'800
	Core Realization	9'500
	Soft MAP Pilot	12'500
	Configuration AIS Machine	50'000 + According to required configuration
	Hourly rate Athenais Support	146