AI with Fanosoft

Artificial Intelligence for Everyone

Artificial Intelligence with Fanosoft

- Image classification with deep learning
- Pix2Pix: Image-to-Image Translation with Conditional Adversarial Nets
- ChatGPT: Generate scientific publications templates from keywords
- Dall.E: Create images, illustration and art from a description in natural language

AI with Fanosoft – Content

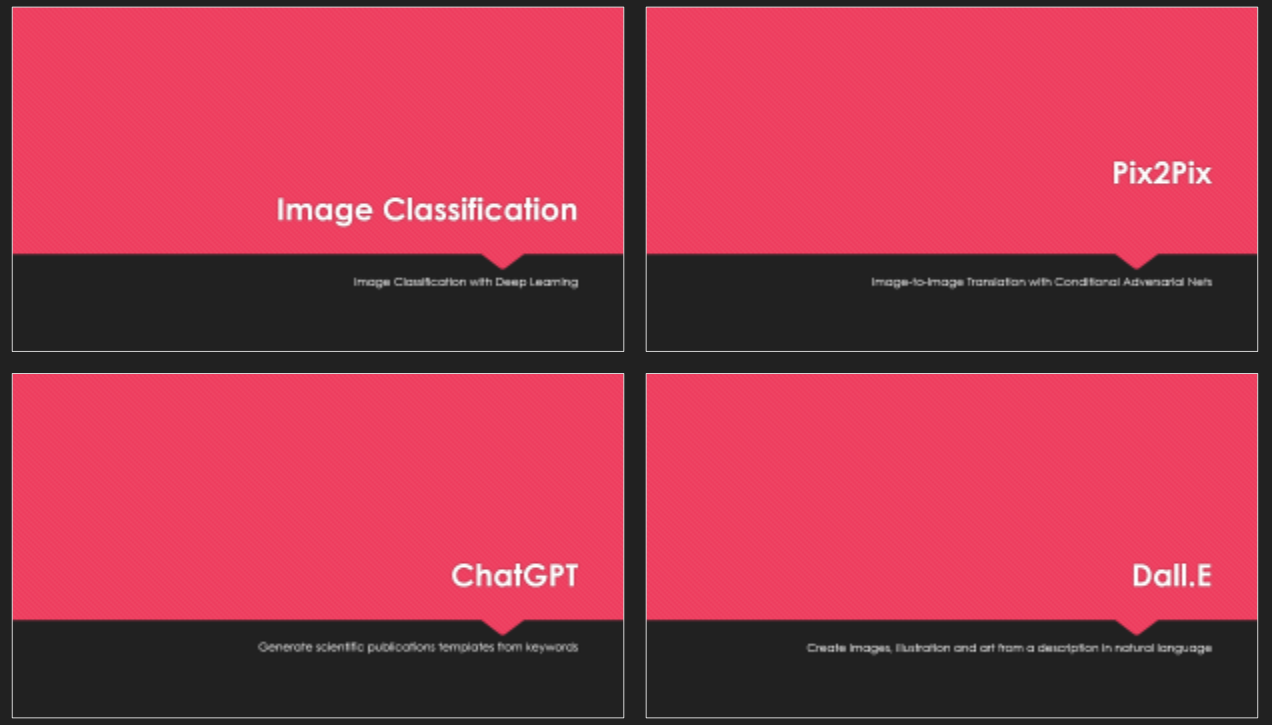


Image Classification

Image Classification with Deep Learning

Image Classification Introduction

- Assign a label or class to an entire image
- Images are expected to have only one class for each image
- Examples of Image classification:
  - Animals: “Cat” or “Dog”
  - Handwritten digits: 0,1,2,…, 9
  - Food: “Salad”, “Burger”, “French Fries” etc.

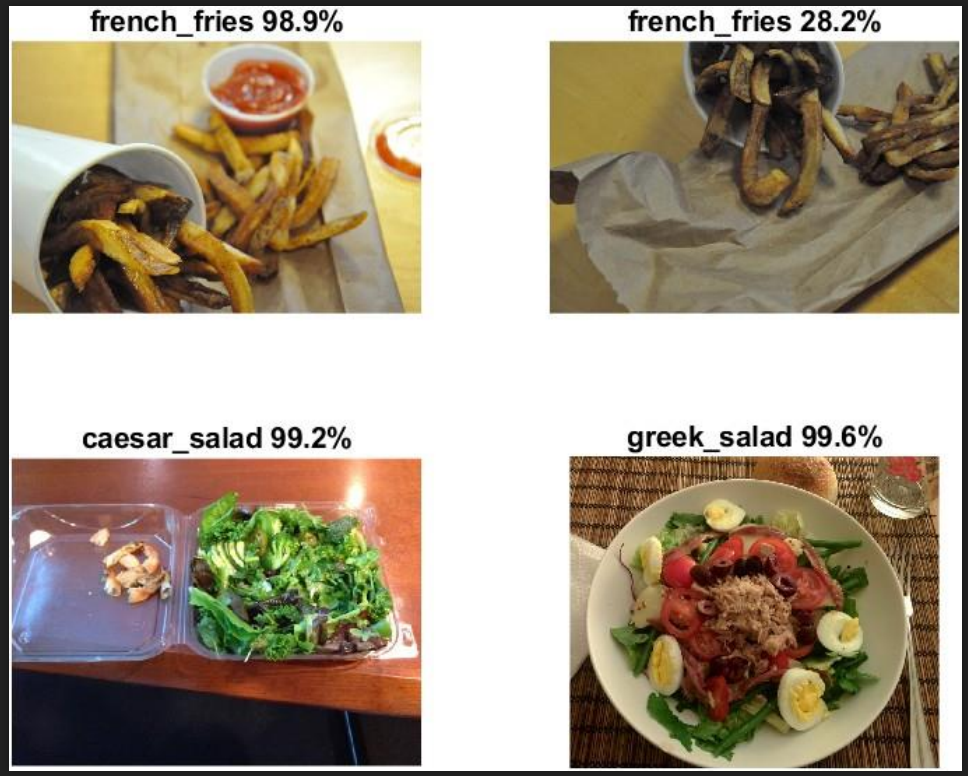
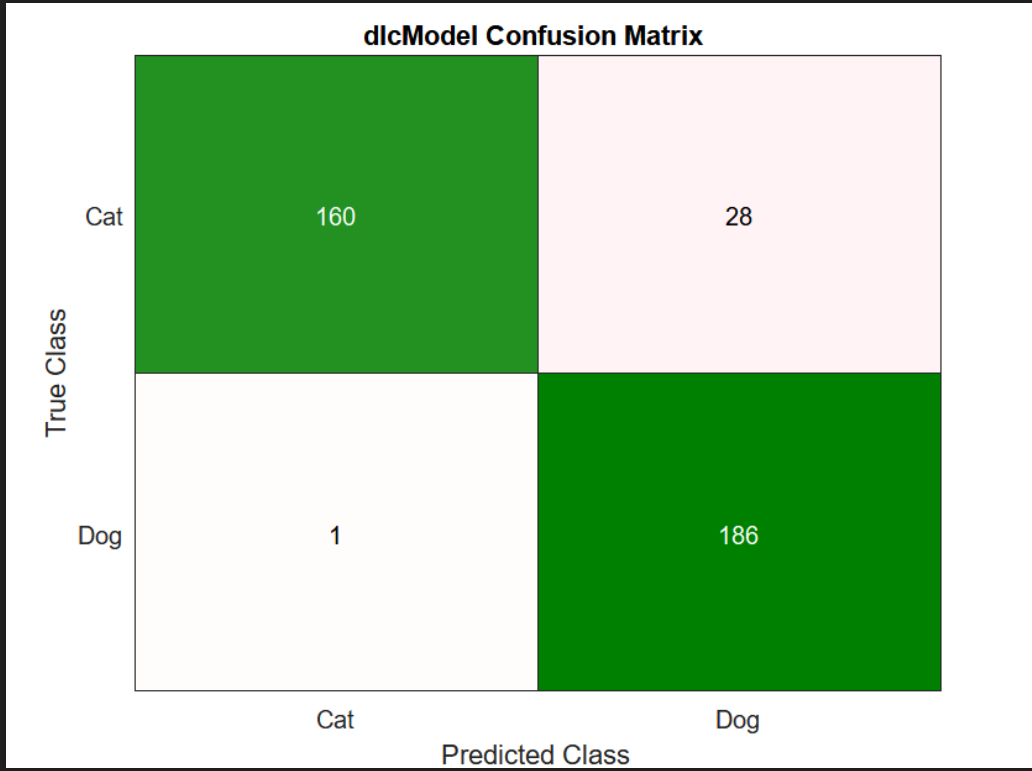


Image Classification Example: Cat or Dog



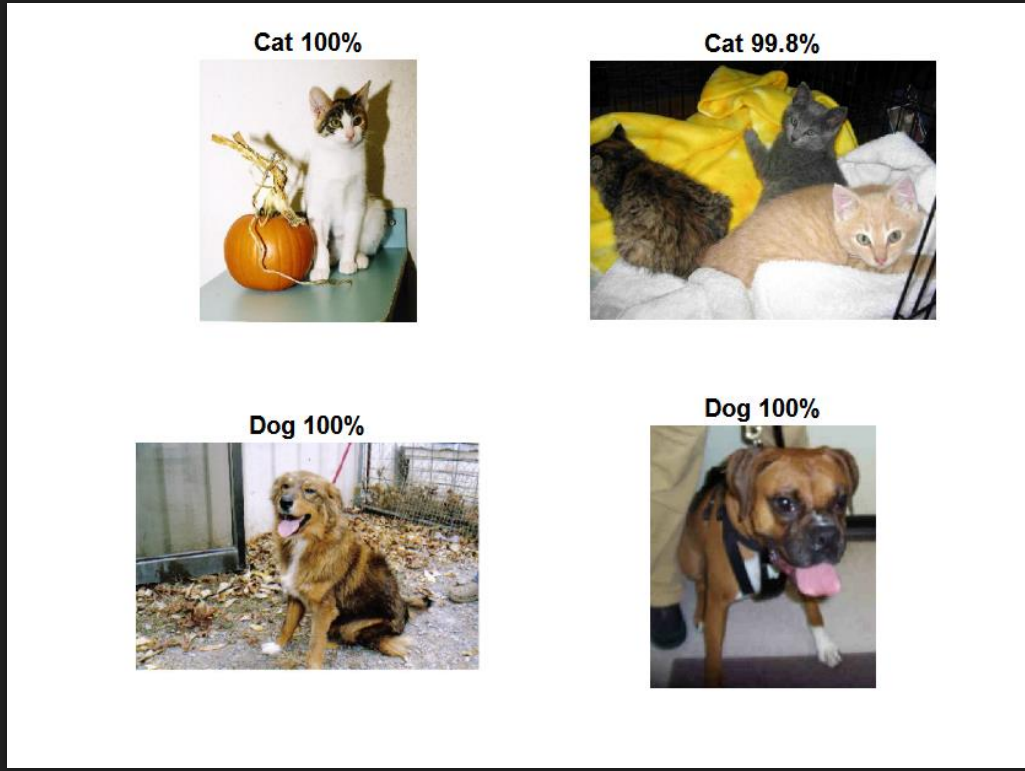
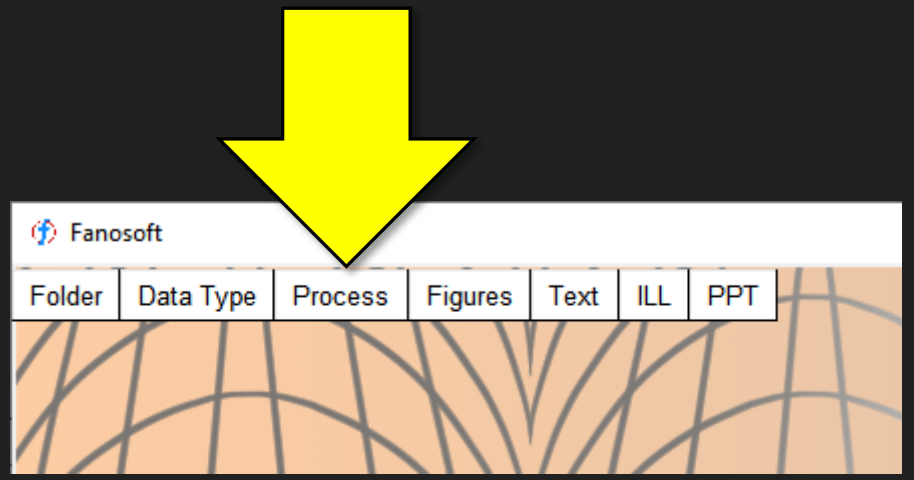


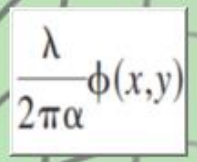
Image Classification in Fanosoft

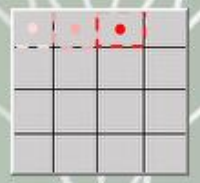
- Click on “Process”

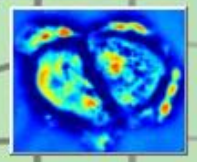


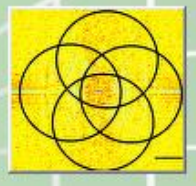
Fanosoft

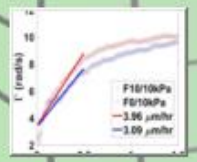
Folder | Data Type | Process | Figures | Text | ILL | PPT

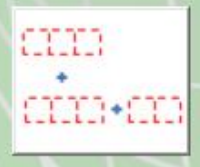


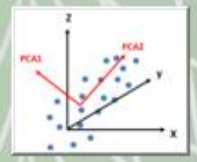












Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

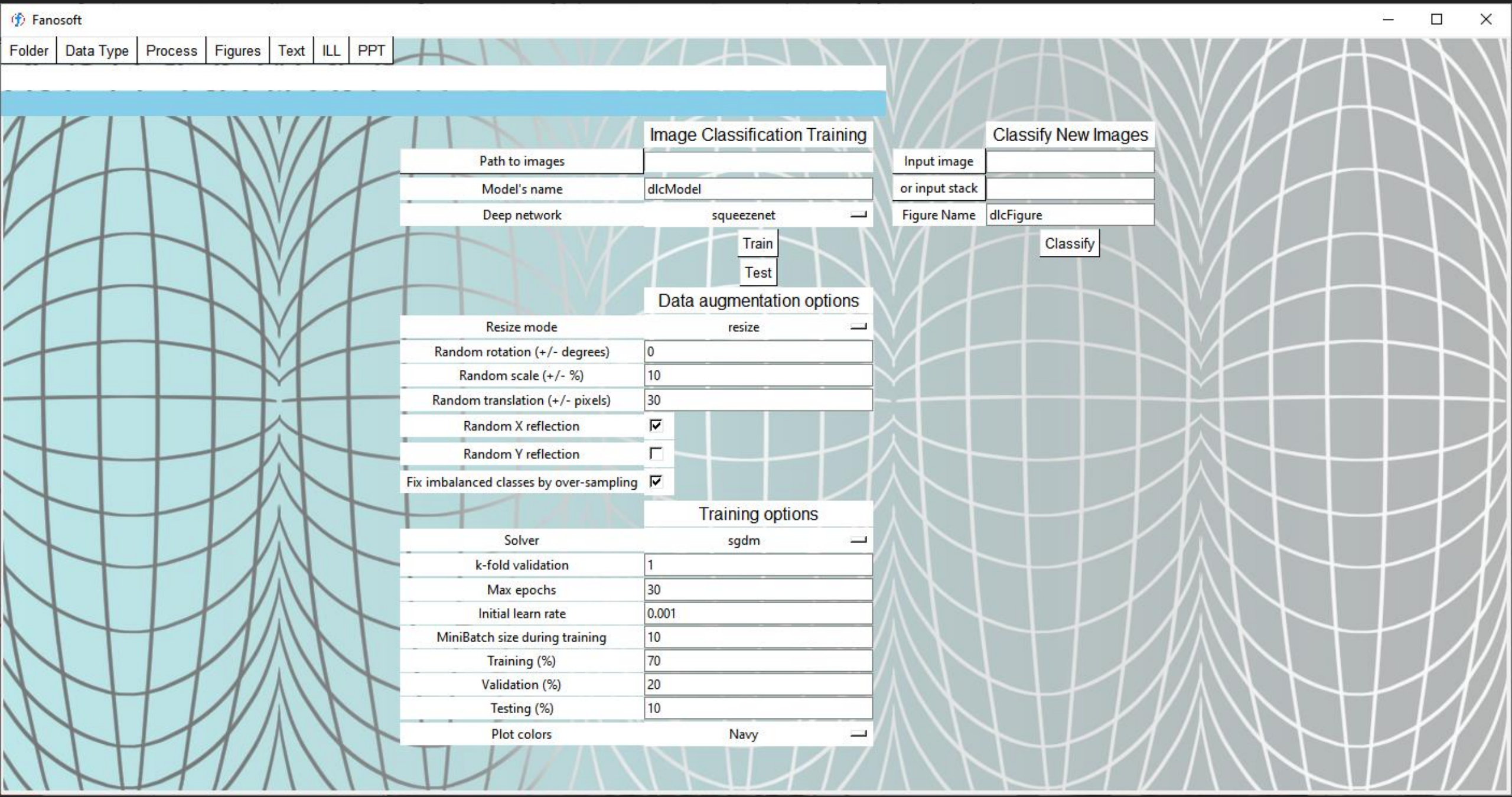

Fanosoft
Folder
Data Type
Process
Figures
Text
ILL
PPT
Image Classification Training
Path to images
Model's name
dlcModel
Deep network
squeezenet
Train
Test
Data augmentation options
Resize mode
resize
Random rotation (+/- degrees)
0
Random scale (+/- %)
10
Random translation (+/- pixels)
30
Random X reflection
Random Y reflection
Fix imbalanced classes by over-sampling
Training options
Solver
sgdm
k-fold validation
1
Max epochs
30
Initial learn rate
0.001
MiniBatch size during training
10
Training (%)
70
Validation (%)
20
Testing (%)
10
Plot colors
Navy
Classify New Images
Input image
or input stack
Figure Name
dlcFigure
Classify

Image Classification in Fanosoft

- Deep Neural Networks used for image classification
- Select the Model / Deep network to train. Available networks are shown on the right
- 3 phases:
  - Train the network with a labelled dataset
  - Test the trained network
  - Classify new images with a trained model
- Fanosoft uses the GPU when available to speed up the training process

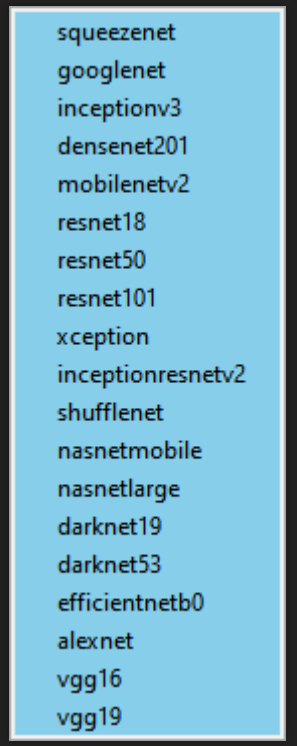


Image Classification - Available Networks

Network	Depth	Size	Parameters (Millions)	Image Input Size
squeezenet	18	5.2 MB	1.24	227-by-227
googlenet	22	27 MB	7.0	224-by-224
inceptionv3	48	89 MB	23.9	299-by-299
densenet201	201	77 MB	20.0	224-by-224
mobilenetv2	53	13 MB	3.5	224-by-224
resnet18	18	44 MB	11.7	224-by-224
resnet50	50	96 MB	25.6	224-by-224
resnet101	101	167 MB	44.6	224-by-224
xception	71	85 MB	22.9	299-by-299
inceptionresnetv2	164	209 MB	55.9	299-by-299
shufflenet	50	5.4 MB	1.4	224-by-224
nasnetmobile	*	20 MB	5.3	224-by-224
nasnetlarge	*	332 MB	88.9	331-by-331
darknet19	19	78 MB	20.8	256-by-256
darknet53	53	155 MB	41.6	256-by-256
efficientnetb0	82	20 MB	5.3	224-by-224
alexnet	8	227 MB	61.0	227-by-227
vgg16	16	515 MB	138	224-by-224
vgg19	19	535 MB	144	224-by-224

Image Classification - Available Networks

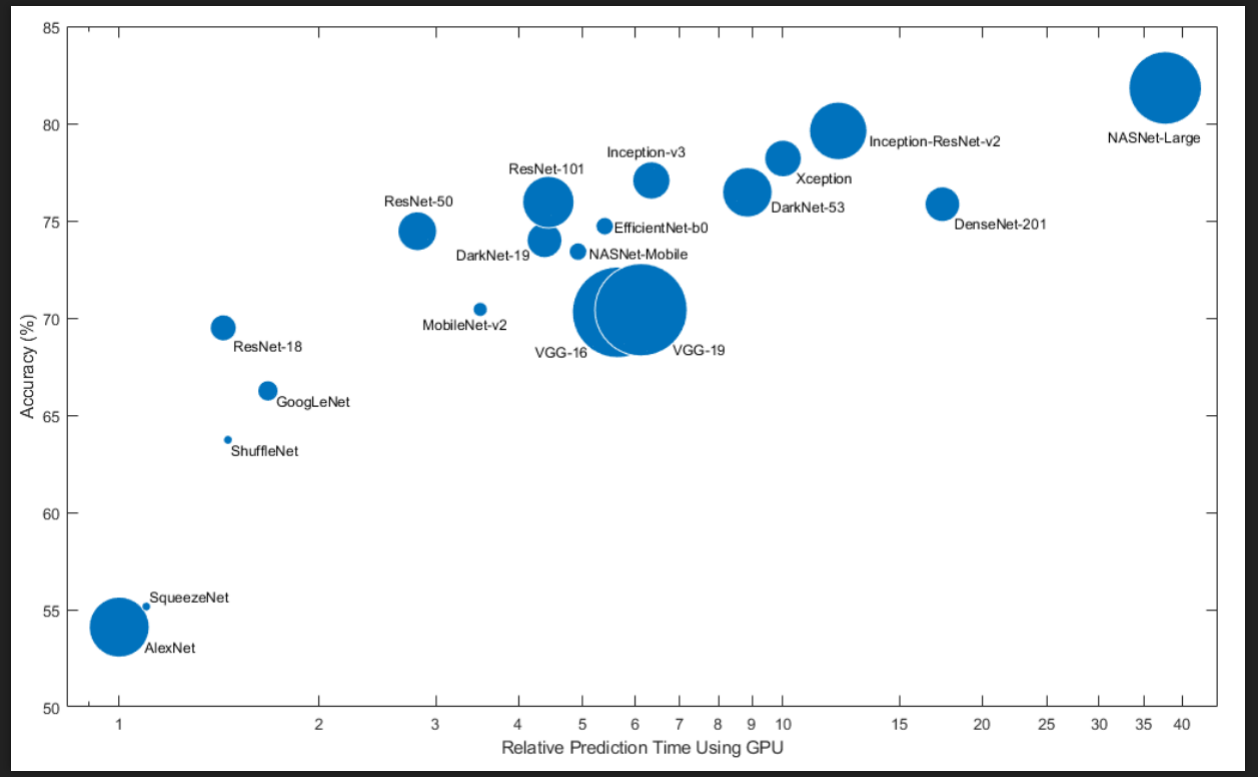


Image Classification – Training Dataset

- Training requires a labelled dataset
- Create one sub-directory for each class
- e.g. Food dataset

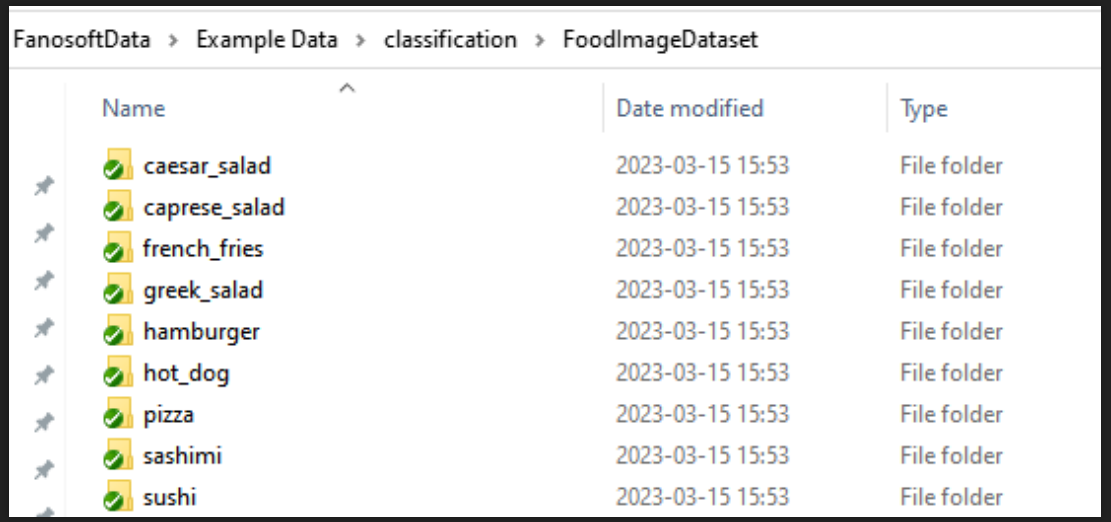


Image Classification – Training Dataset

- In each sub-directory, copy all images that belong to this class
- e.g. “Caesar salad” content
- Fanosoft assumes number of classes = number of sub-directories

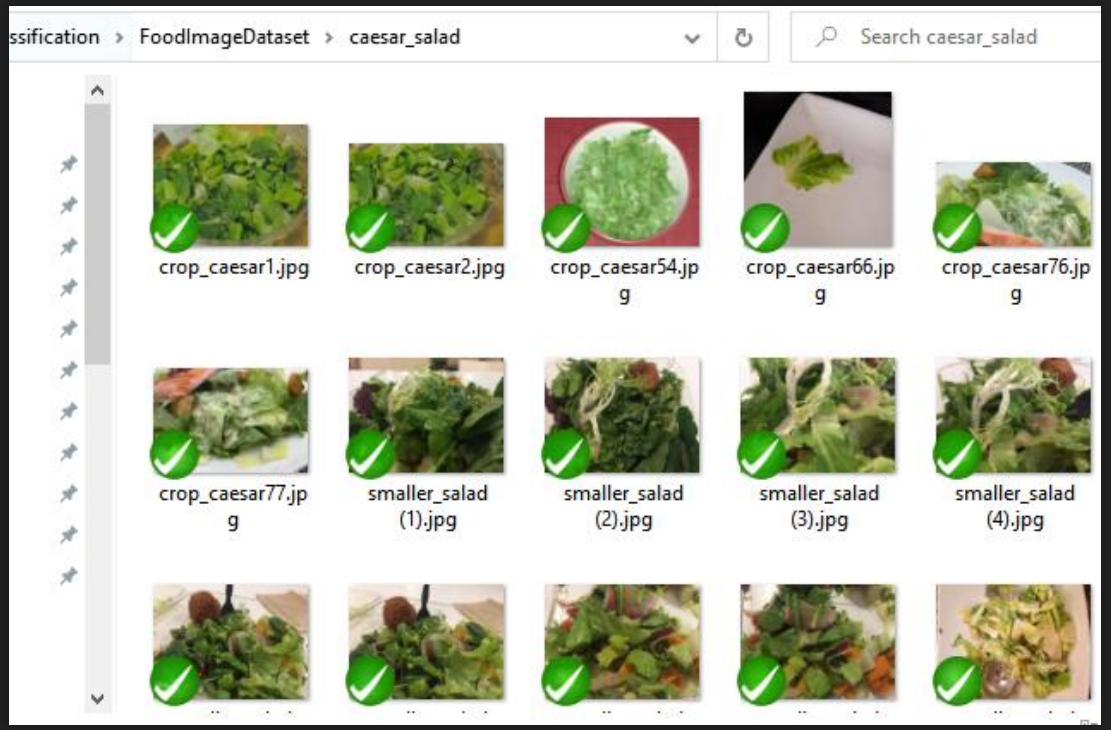


Image Classification – Training Options

- All images are resized to the input resolution of the selected neural network
  - e.g. 224x224 pixels for GoogleNet
- 3 resizing options available
  - Resize: Scale each image to 224x224
  - Center crop: Extract a 224x224 rectangle in the center of the image
  - Random crop: Extract a 224x224 rectangle area at a random position in the image

Image Classification – Training Options

- Training dataset can be artificially inflated with data augmentation
- Data augmentation improves accuracy and robustness of the trained network
- Resizing and data augmentation are performed "on the fly" when loading images from disk

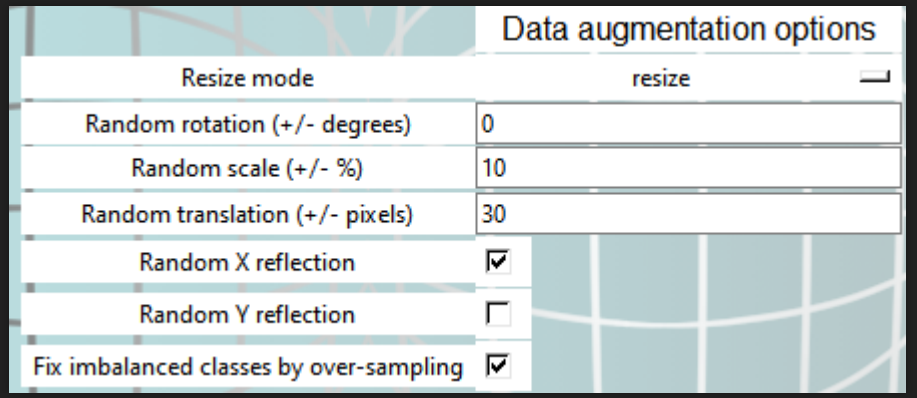
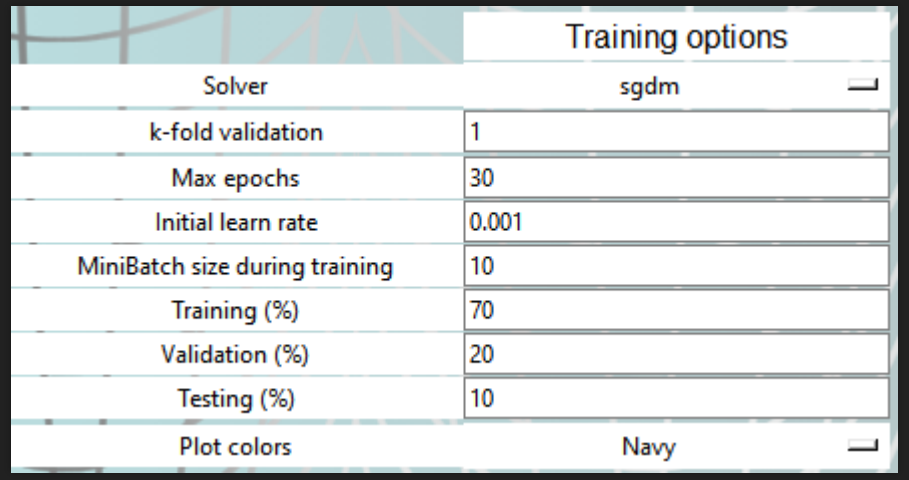
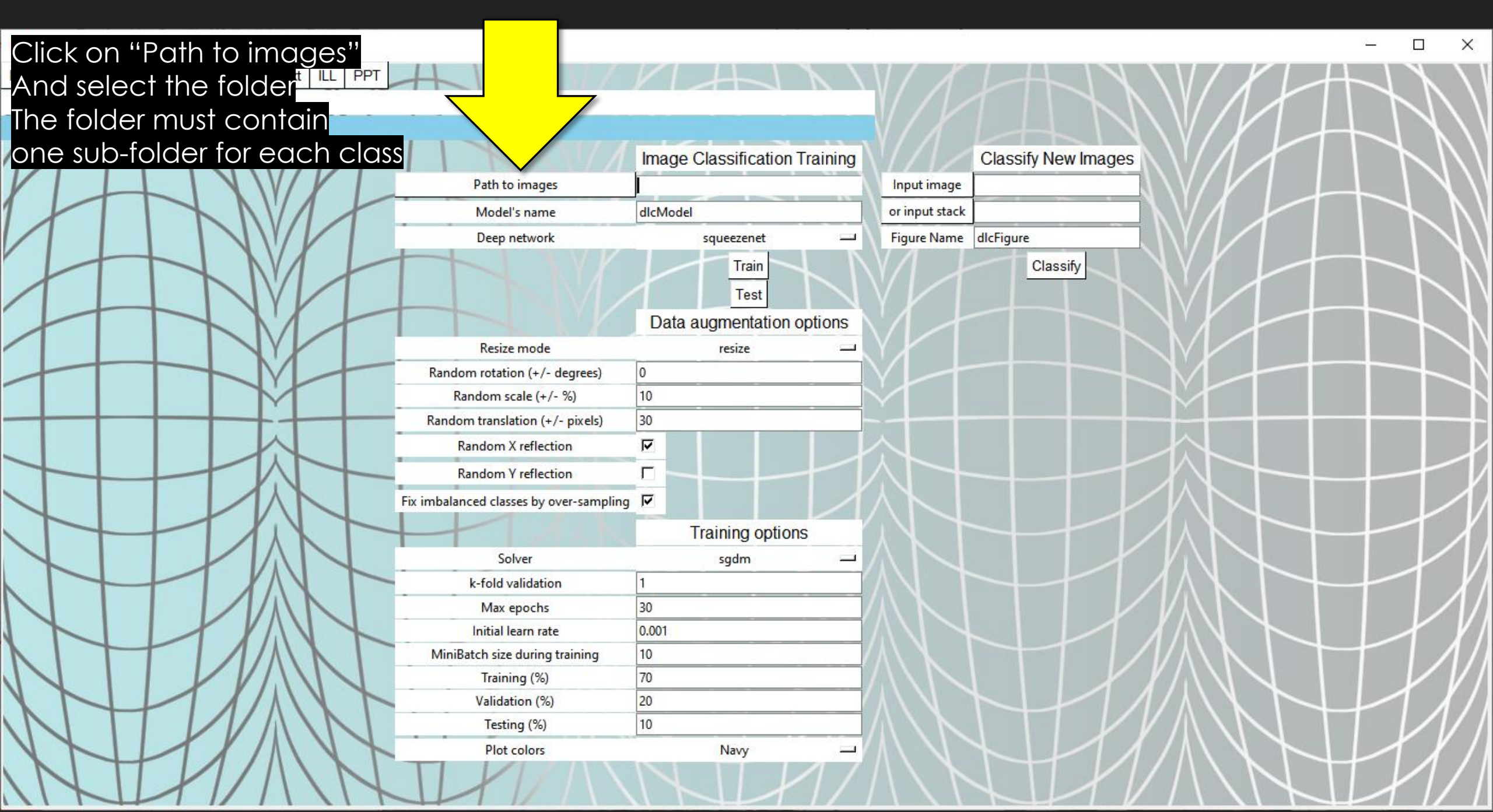


Image Classification – Training Options

- For advanced users, it's possible to customize the training options
- By default, training is done with 70% of images, 20% is reserved for validation and 10% for final testing
- Validation is used to measure the classification accuracy on new images, that were not used during training (i.e. out-of-sample validation)
- Optional k-fold validation




Click on “Path to images”
And select the folder
The folder must contain
one sub-folder for each class
ILL
PPT
Image Classification Training
Path to images
Model's name
dlcModel
Deep network
squeezenet
Train
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Data augmentation options
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Fix imbalanced classes by over-sampling
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k-fold validation
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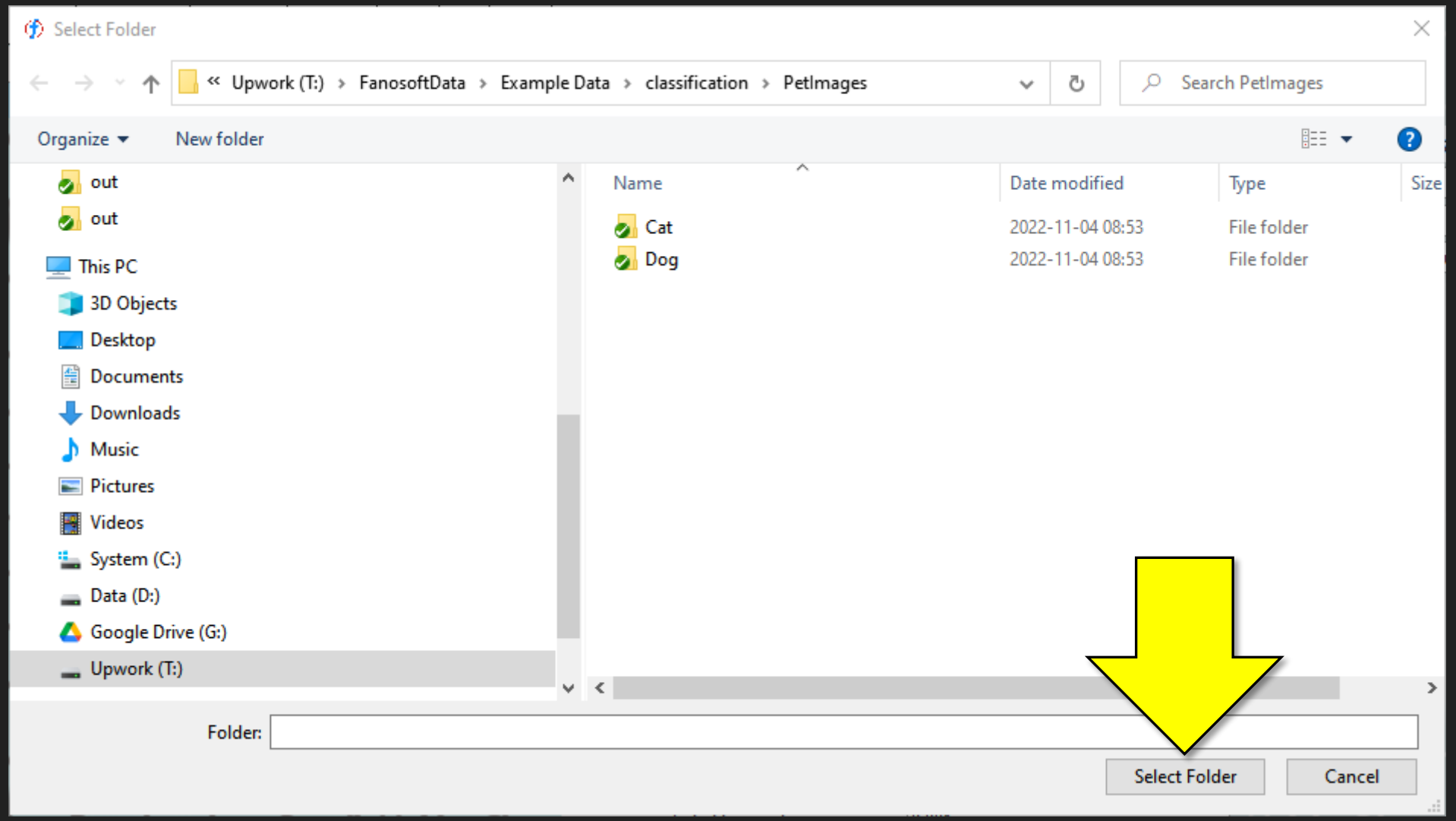
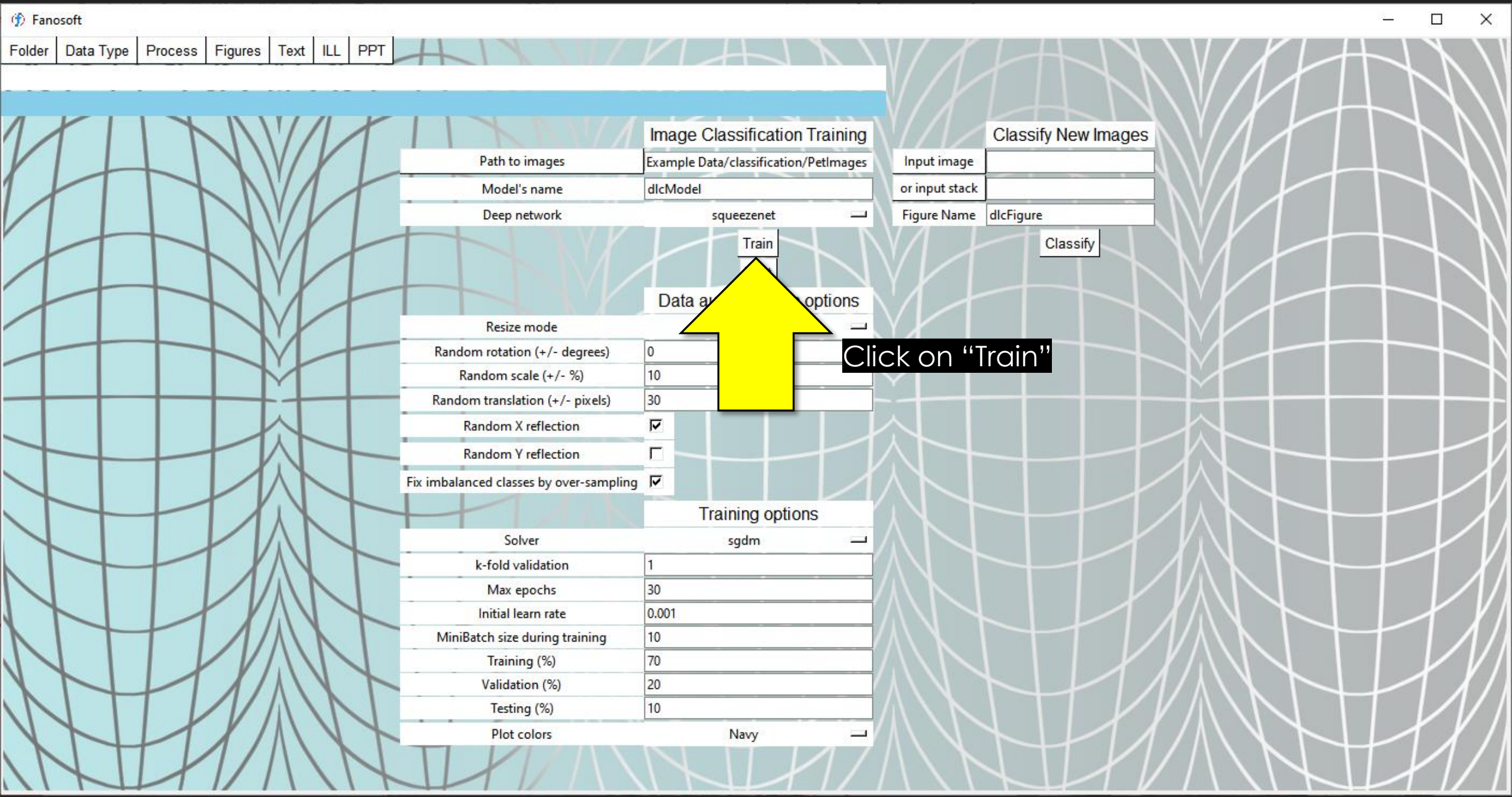

Select Folder
Upwork (T:) › FanosoftData › Example Data › classification › PetImages
Search PetImages
Organize
New folder
out
out
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
System (C:)
Data (D:)
Google Drive (G:)
Upwork (T:)
Name
Date modified
Type
Size
Cat
2022-11-04 08:53
File folder
Dog
2022-11-04 08:53
File folder
Folder:
Select Folder
Cancel


Fanosoft
Folder
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Figures
Text
ILL
PPT
Image Classification Training
Path to images
Example Data/classification/PetImages
Model's name
dlcModel
Deep network
squeezenet
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Resize mode
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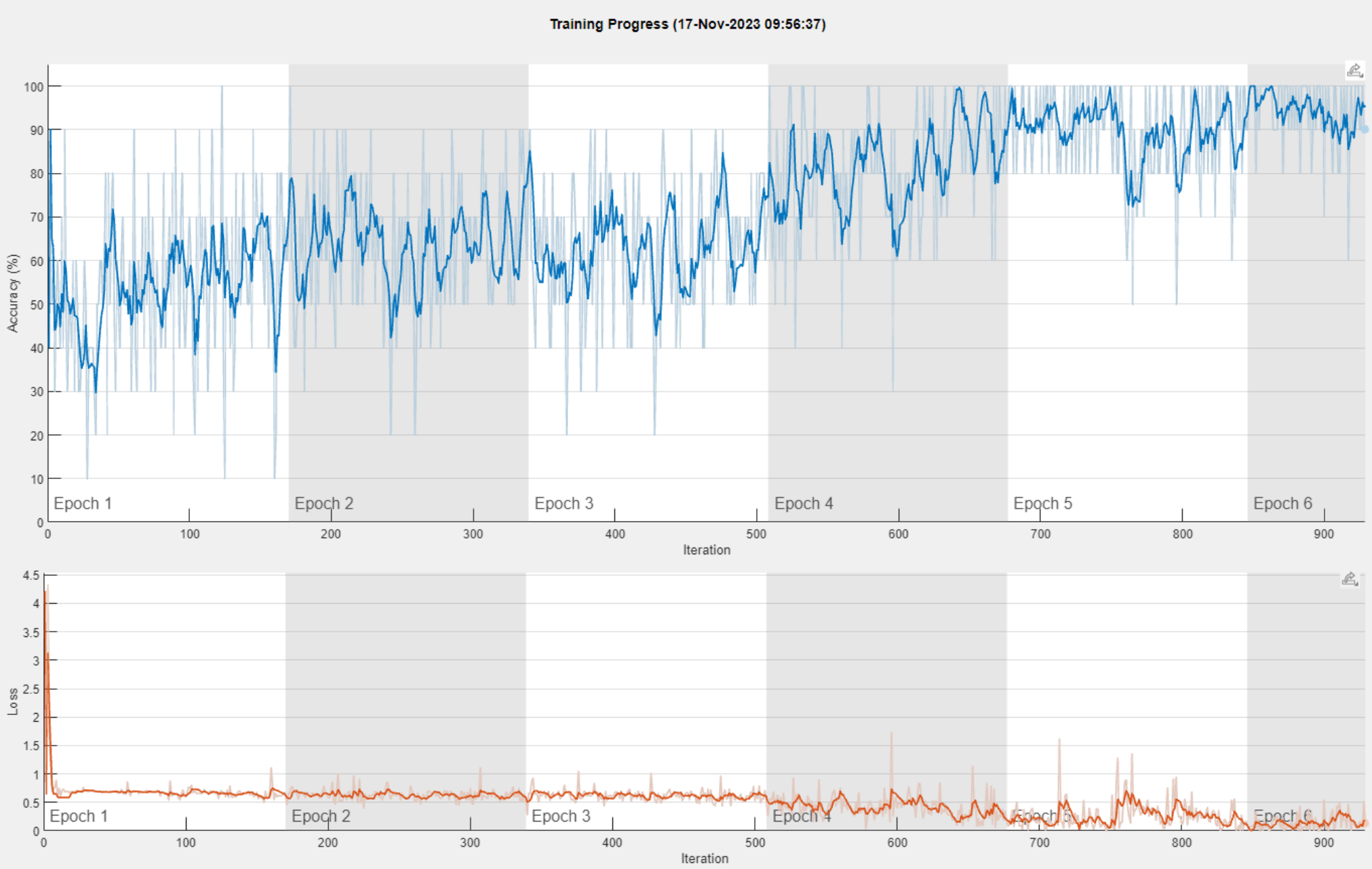
Classify
Click on "Train"

Training Progress (17-Nov-2023 09:56:37)



Training iteration 930 of 5070...

Training Time

Start time:	17-Nov-2023 09:56:37
Elapsed time:	3 min 22 sec

Training Cycle

Epoch:	6 of 30
Iterations per epoch:	169
Maximum iterations:	5070

Validation

Frequency:	N/A

Other Information

Hardware resource:	Single GPU
Learning rate schedule:	Constant
Learning rate:	0.001

Export as Image Learn more

Accuracy
- Training (smoothed)
- Training
- Validation

Loss
- Training (smoothed)
- Training
- Validation

Image Classification – Results

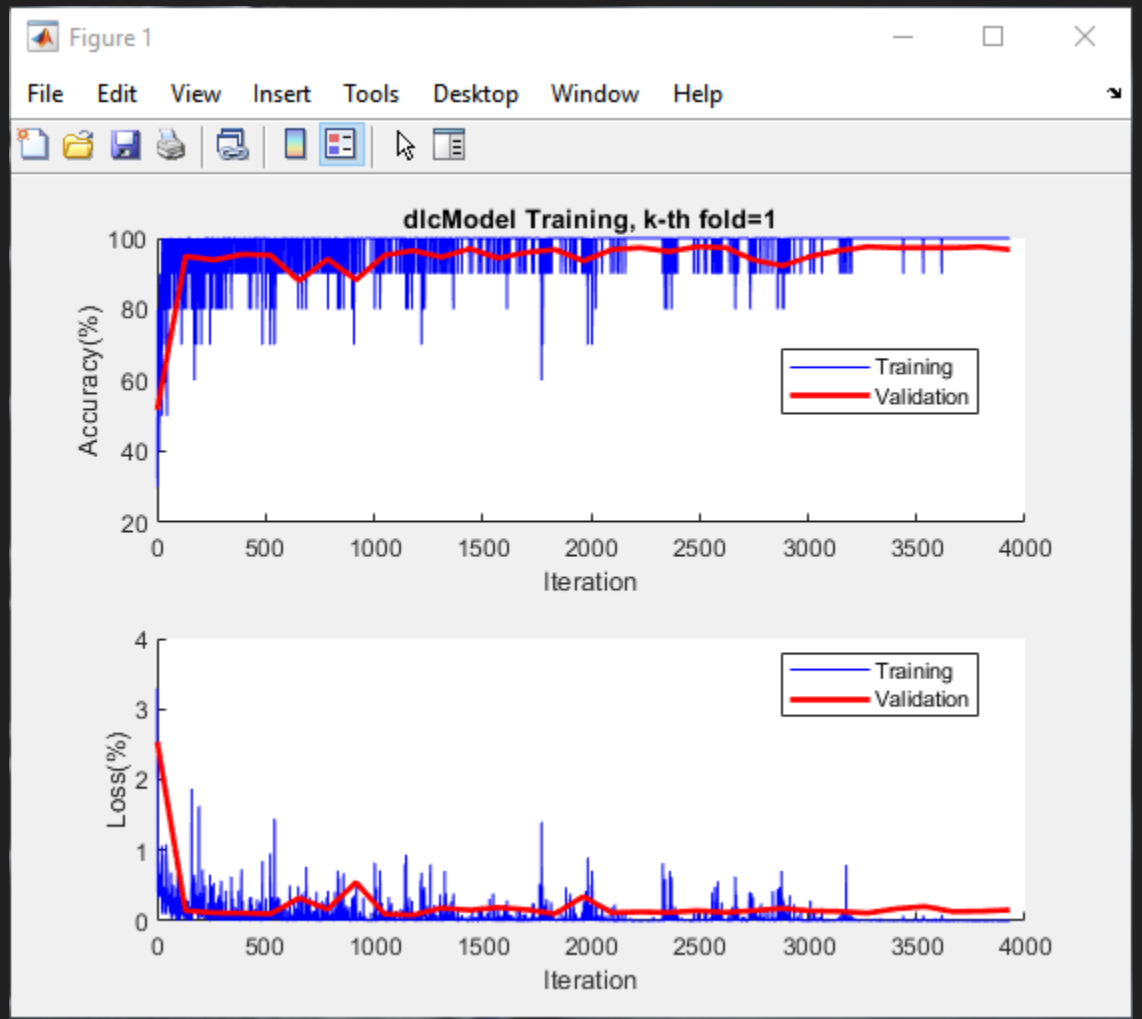


Image Classification – Results

Image Classification – Results

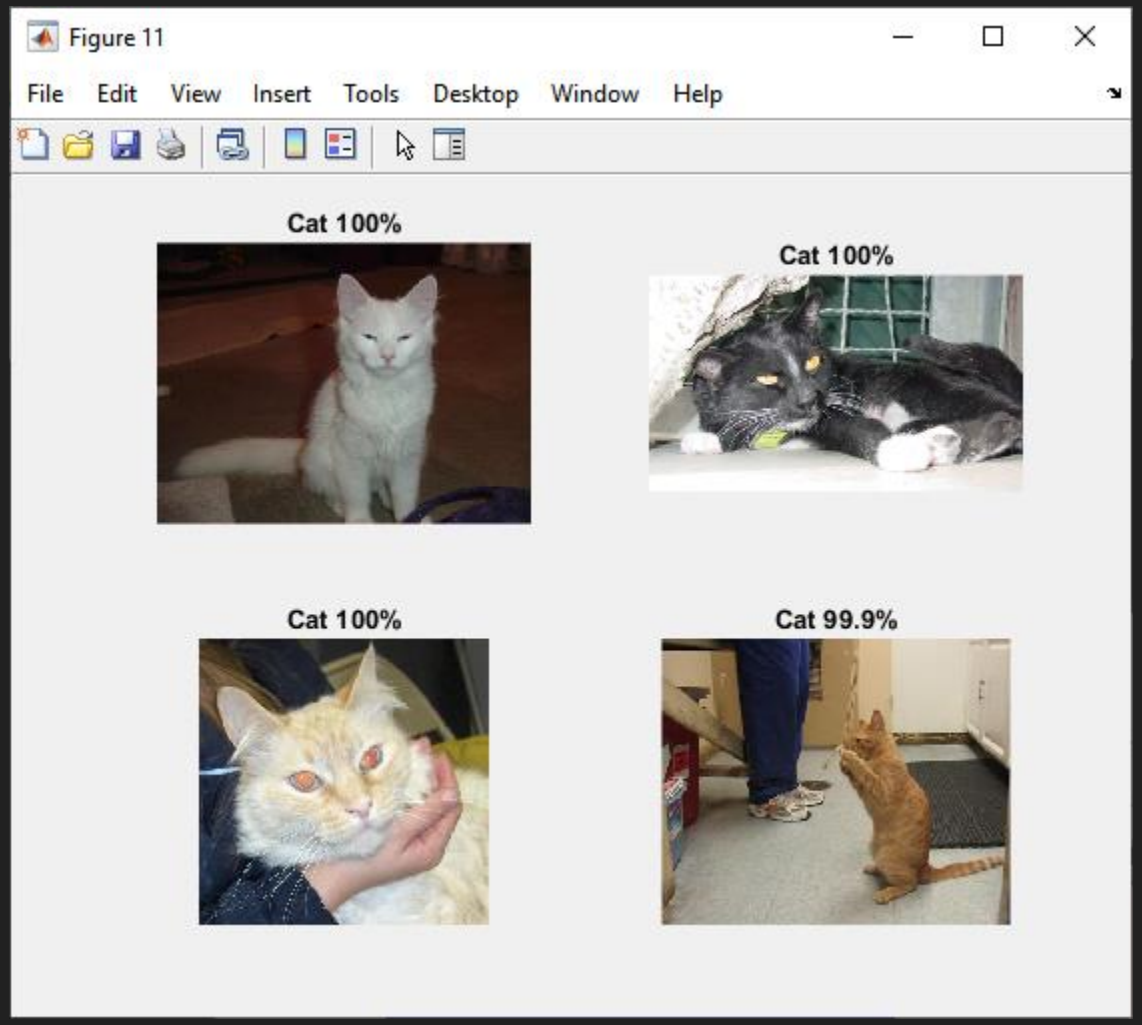
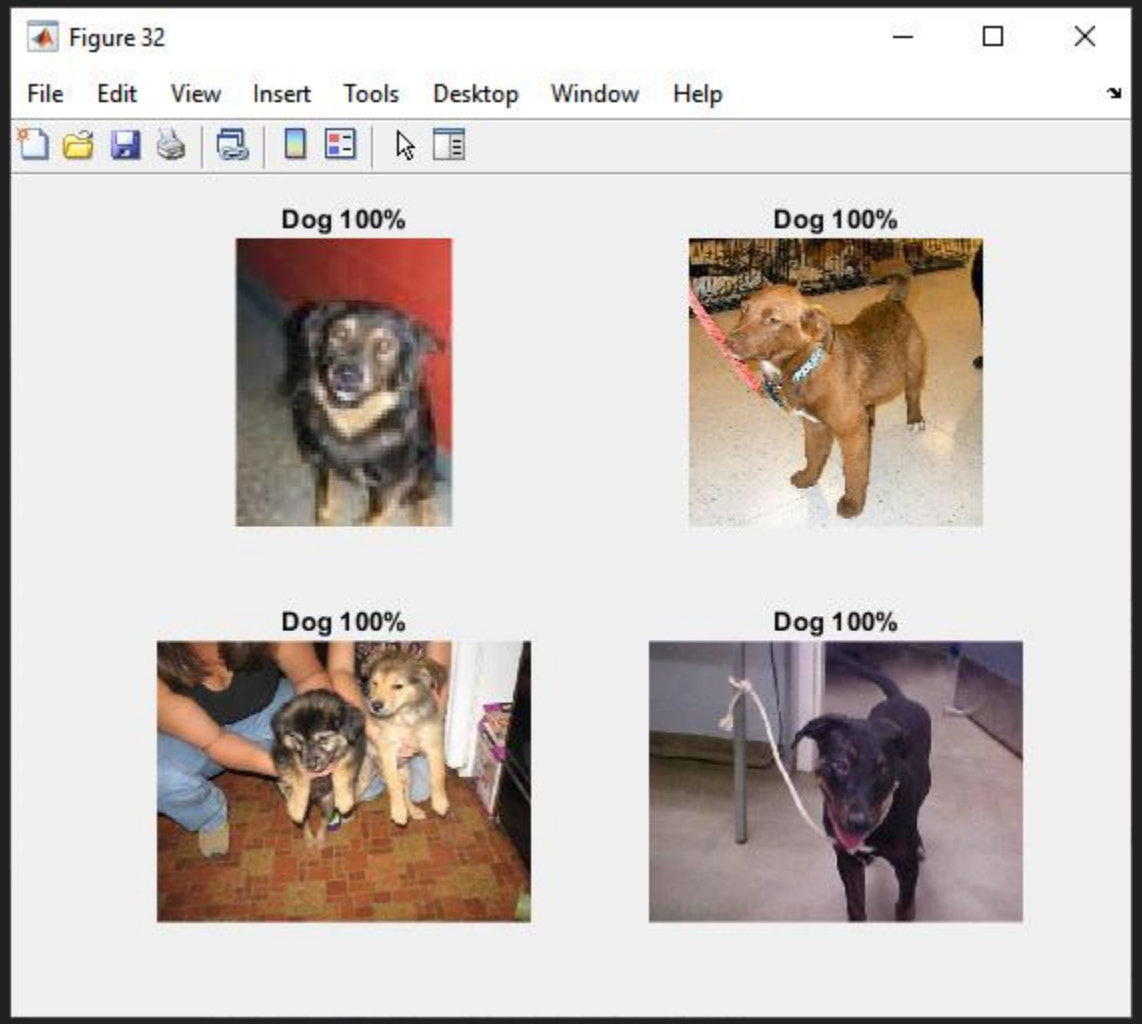


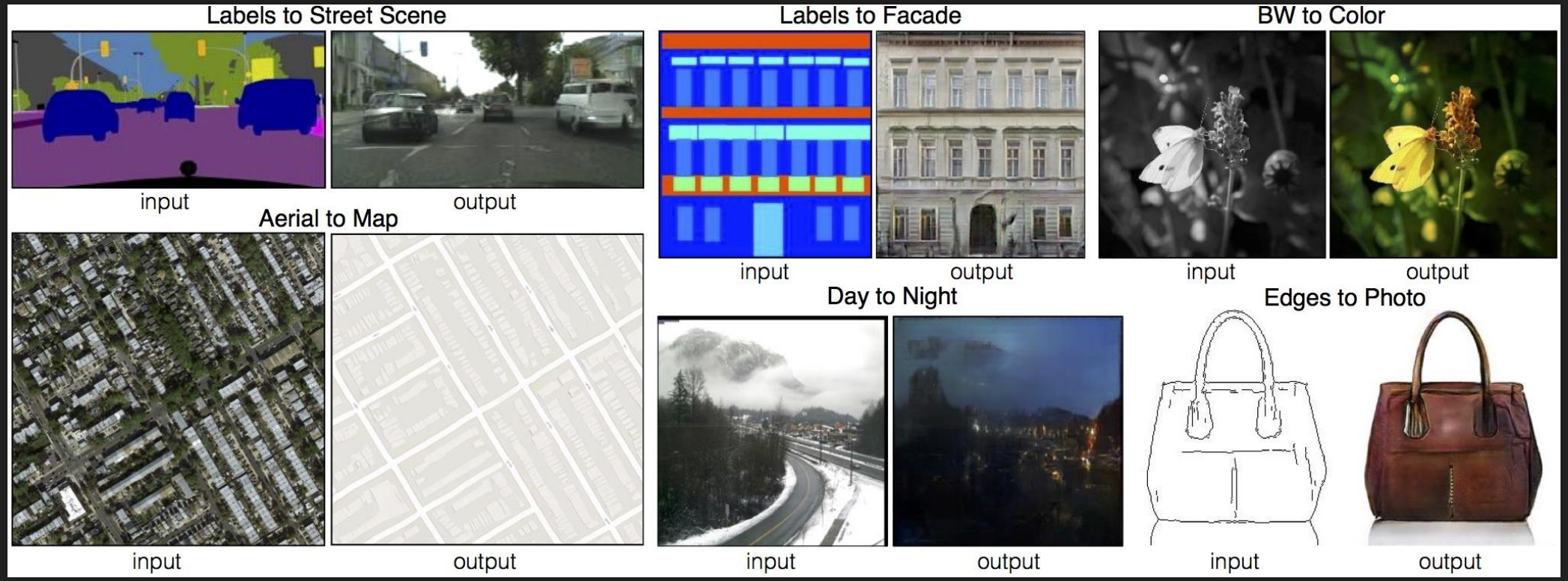
Image Classification – Results



Pix2Pix

Image-to-Image Translation with Conditional Adversarial Nets

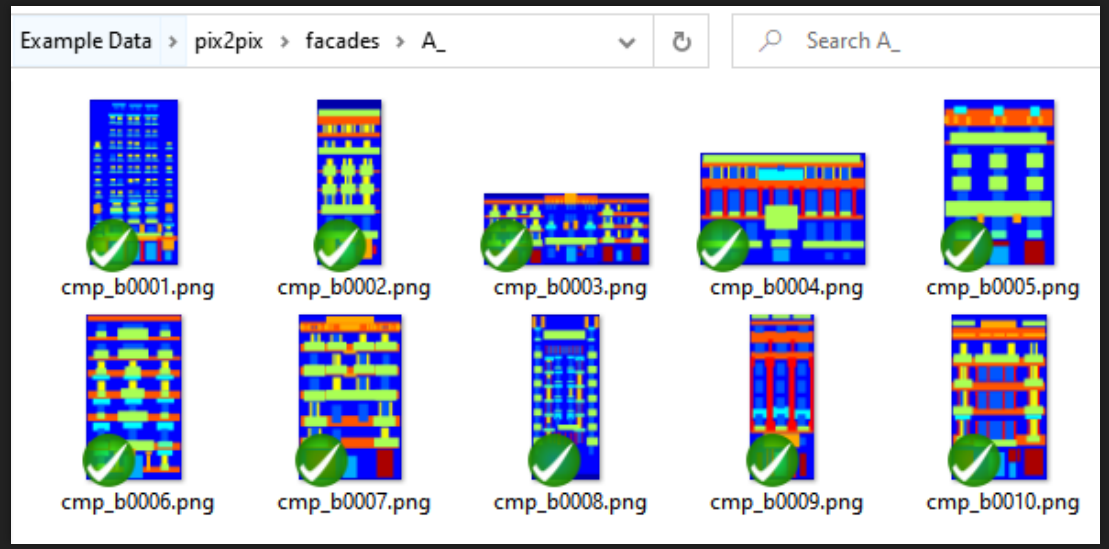
Pix2Pix Examples

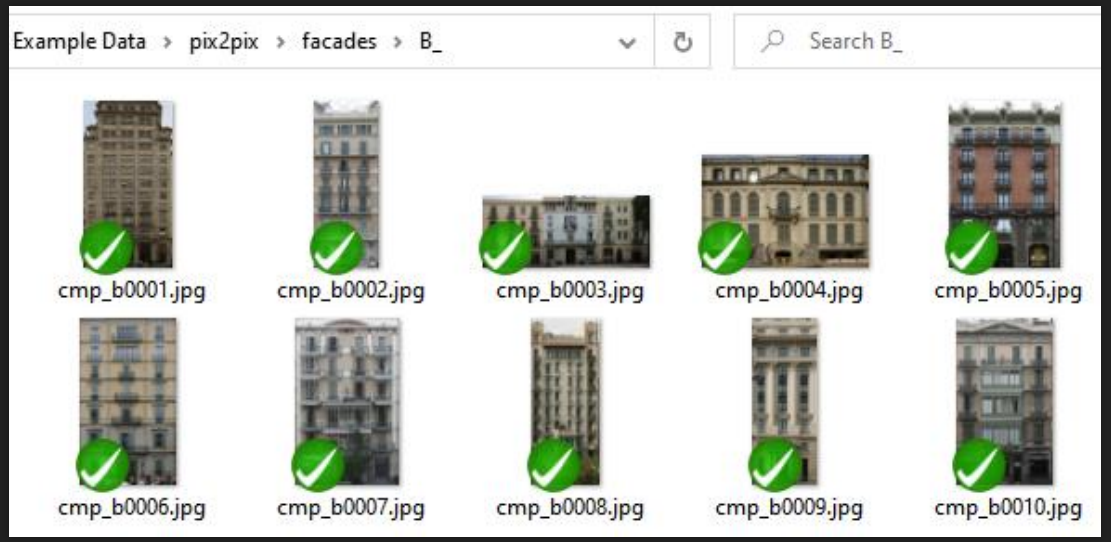


Pix2Pix Introduction

- Pix2Pix = Image-to-Image Translation with Conditional Adversarial Nets
- Training requires a paired dataset:
  - 2 folders, one for the input images and one for the output images
  - Input and output images must have the same filename
  - e.g. “input\cmp_b004.jpg” → “output\cmp_b004.jpg”
- Fanosoft uses the GPU when available to speed up the training process

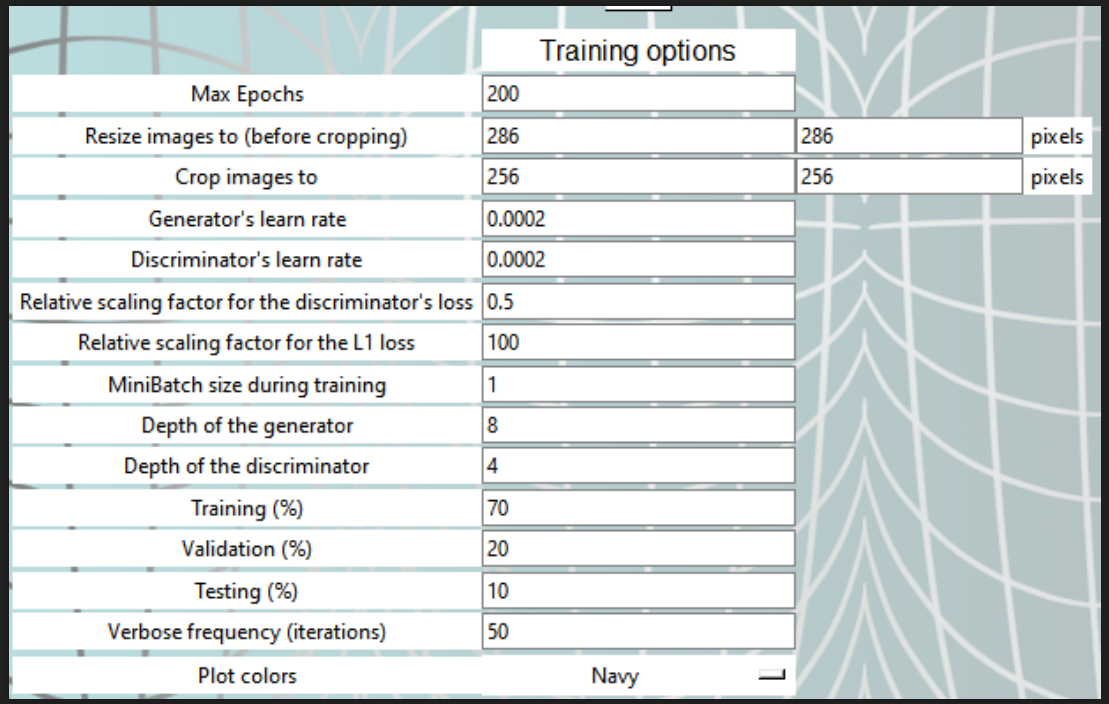
Pix2Pix Dataset Example: Facade





Pix2Pix Training Options

- 200 epochs
- All images resized to 286x286 pixels and cropped to 256x256 pixels for training
- 70% training, 20% validation and 10% testing (configurable)
  - Training images used to train the neural network weights
  - Validation images used to show translation results on unseen images during training
  - Test images used only at the end of training to show some translation examples

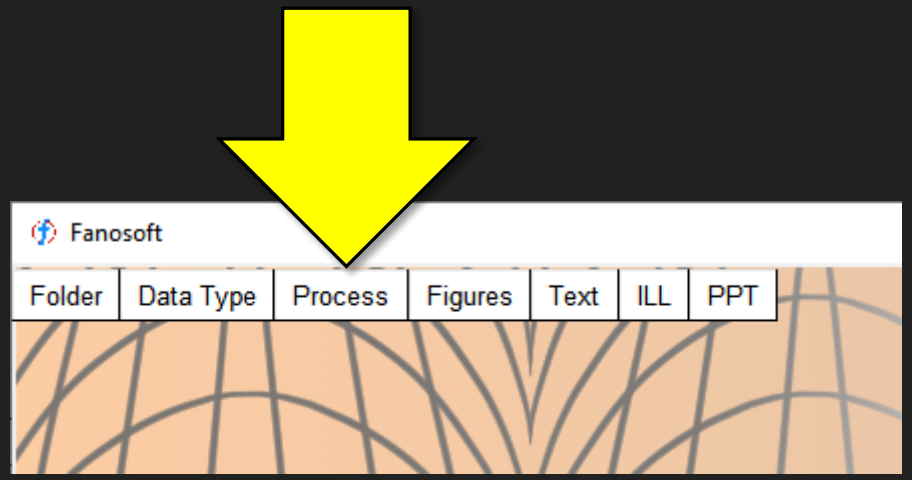


Training options

Max Epochs	200		
Resize images to (before cropping)	286	286	pixels
Crop images to	256	256	pixels
Generator's learn rate	0.0002		
Discriminator's learn rate	0.0002		
Relative scaling factor for the discriminator's loss	0.5		
Relative scaling factor for the L1 loss	100		
MiniBatch size during training	1		
Depth of the generator	8		
Depth of the discriminator	4		
Training (%)	70		
Validation (%)	20		
Testing (%)	10		
Verbose frequency (iterations)	50		
Plot colors	Navy		

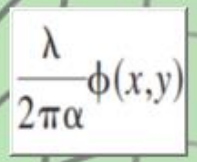
Pix2Pix in Fanosoft

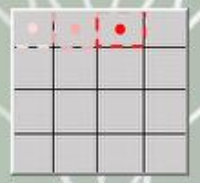
- Click on “Process”

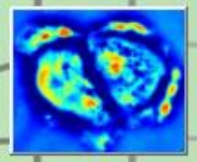


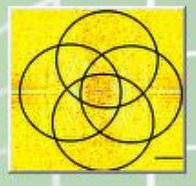
Fanosoft

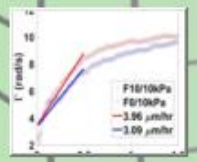
Folder | Data Type | Process | Figures | Text | ILL | PPT

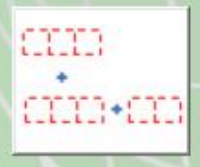


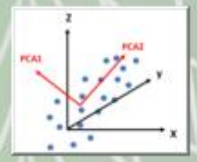












Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

dlcModel

Select folder with input images

Image-to-Image Training

Path to input images	
Path to output images	
Model's name	p2pModel

Train

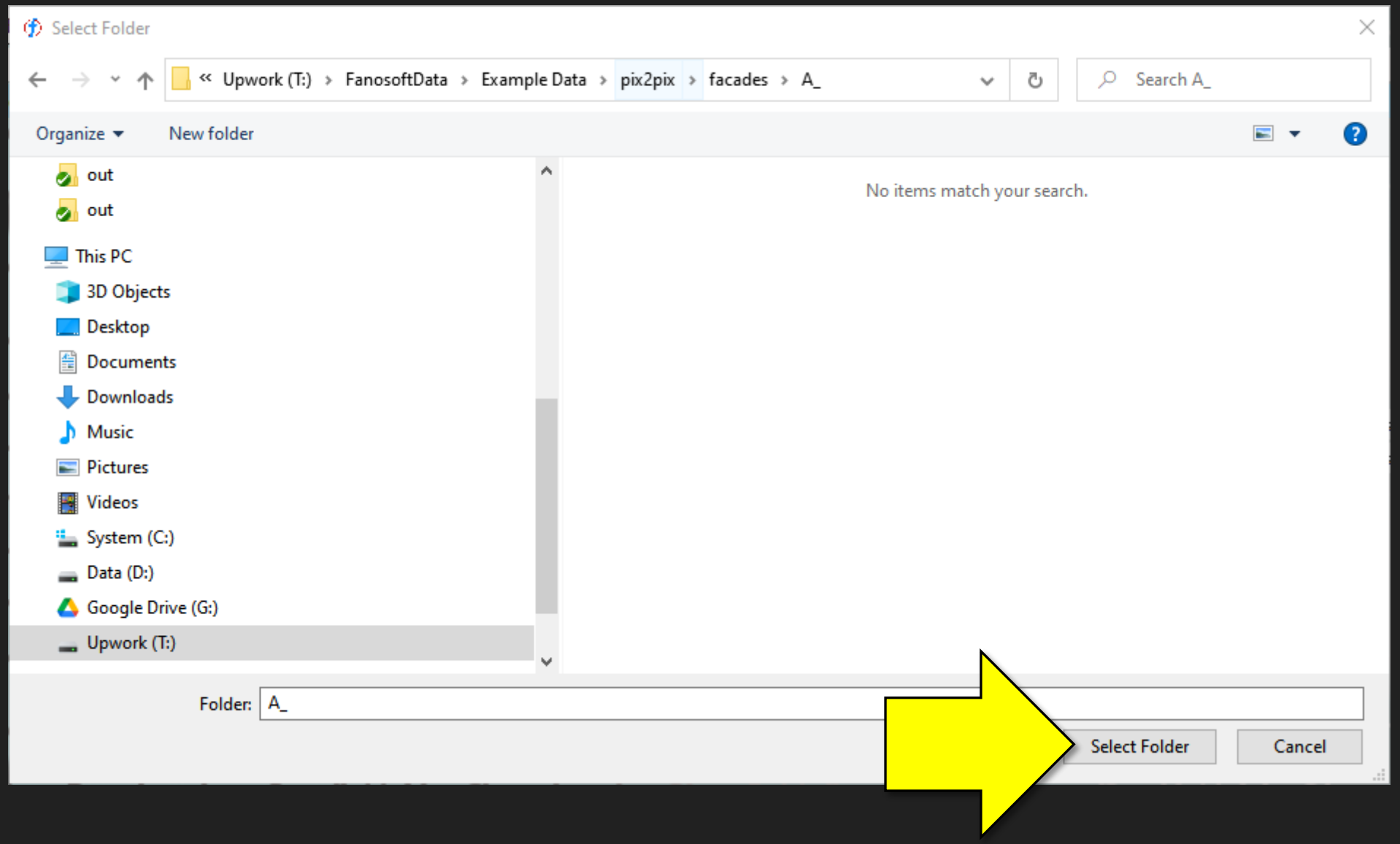
Training options

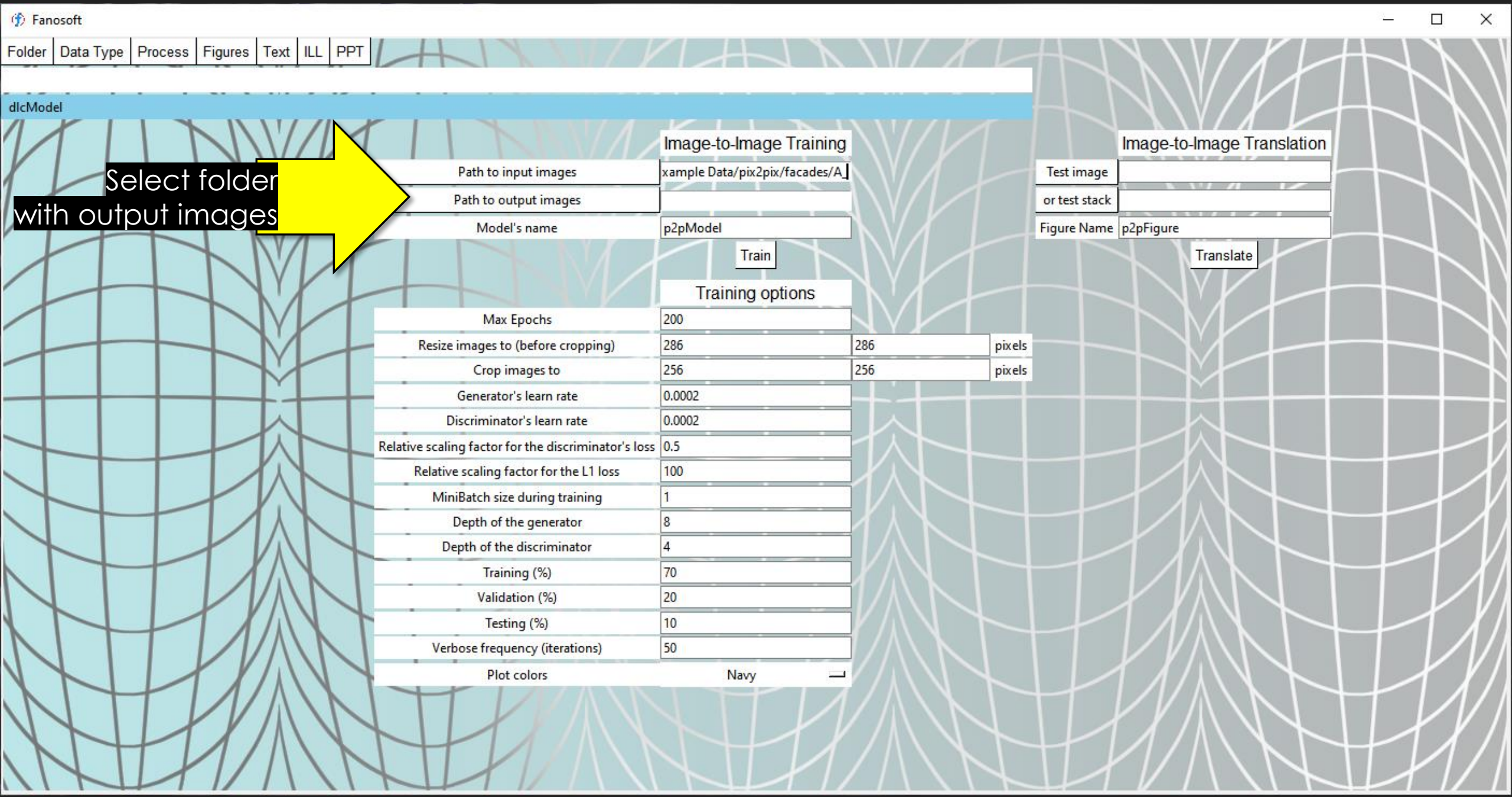
Max Epochs	200		
Resize images to (before cropping)	286	286	pixels
Crop images to	256	256	pixels
Generator's learn rate	0.0002		
Discriminator's learn rate	0.0002		
Relative scaling factor for the discriminator's loss	0.5		
Relative scaling factor for the L1 loss	100		
MiniBatch size during training	1		
Depth of the generator	8		
Depth of the discriminator	4		
Training (%)	70		
Validation (%)	20		
Testing (%)	10		
Verbose frequency (iterations)	50		
Plot colors	Navy		

Image-to-Image Translation

Test image	
or test stack	
Figure Name	p2pFigure

Translate


Select Folder
Upwork (T:) › FanosoftData › Example Data › pix2pix › facades › A_
Search A_
Organize
New folder
out
out
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
System (C:)
Data (D:)
Google Drive (G:)
Upwork (T:)
No items match your search.
Folder:
A_
Select Folder
Cancel


Fanosoft
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Select folder with output images
Image-to-Image Training
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Path to output images
Model's name
p2pModel
Train
Training options
Max Epochs
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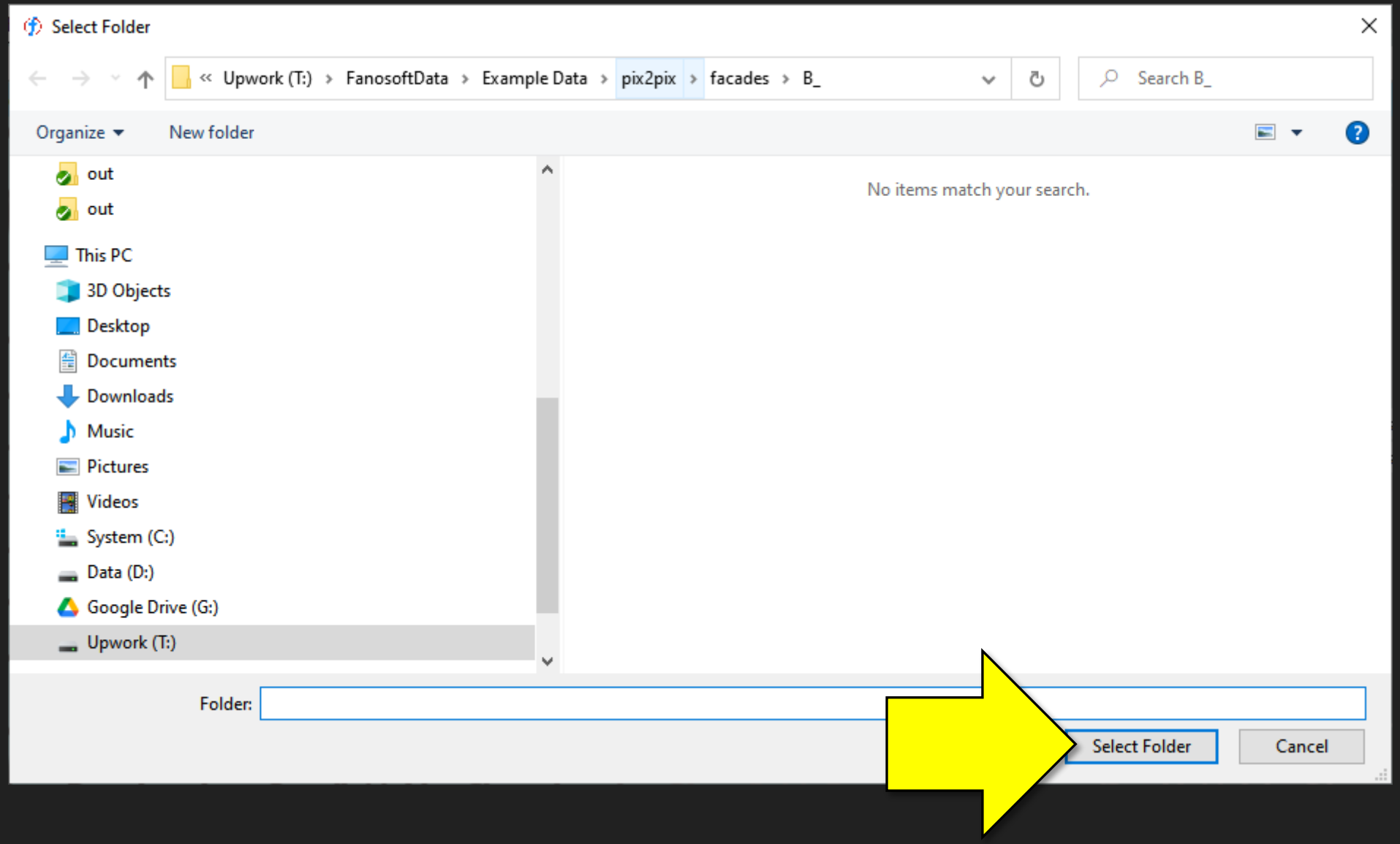
Resize images to (before cropping)
286
286
pixels
Crop images to
256
256
pixels
Generator's learn rate
0.0002
Discriminator's learn rate
0.0002
Relative scaling factor for the discriminator's loss
0.5
Relative scaling factor for the L1 loss
100
MiniBatch size during training
1
Depth of the generator
8
Depth of the discriminator
4
Training (%)
70
Validation (%)
20
Testing (%)
10
Verbose frequency (iterations)
50
Plot colors
Navy
Image-to-Image Translation
Test image
or test stack
Figure Name
p2pFigure
Translate


Select Folder
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Downloads
Music
Pictures
Videos
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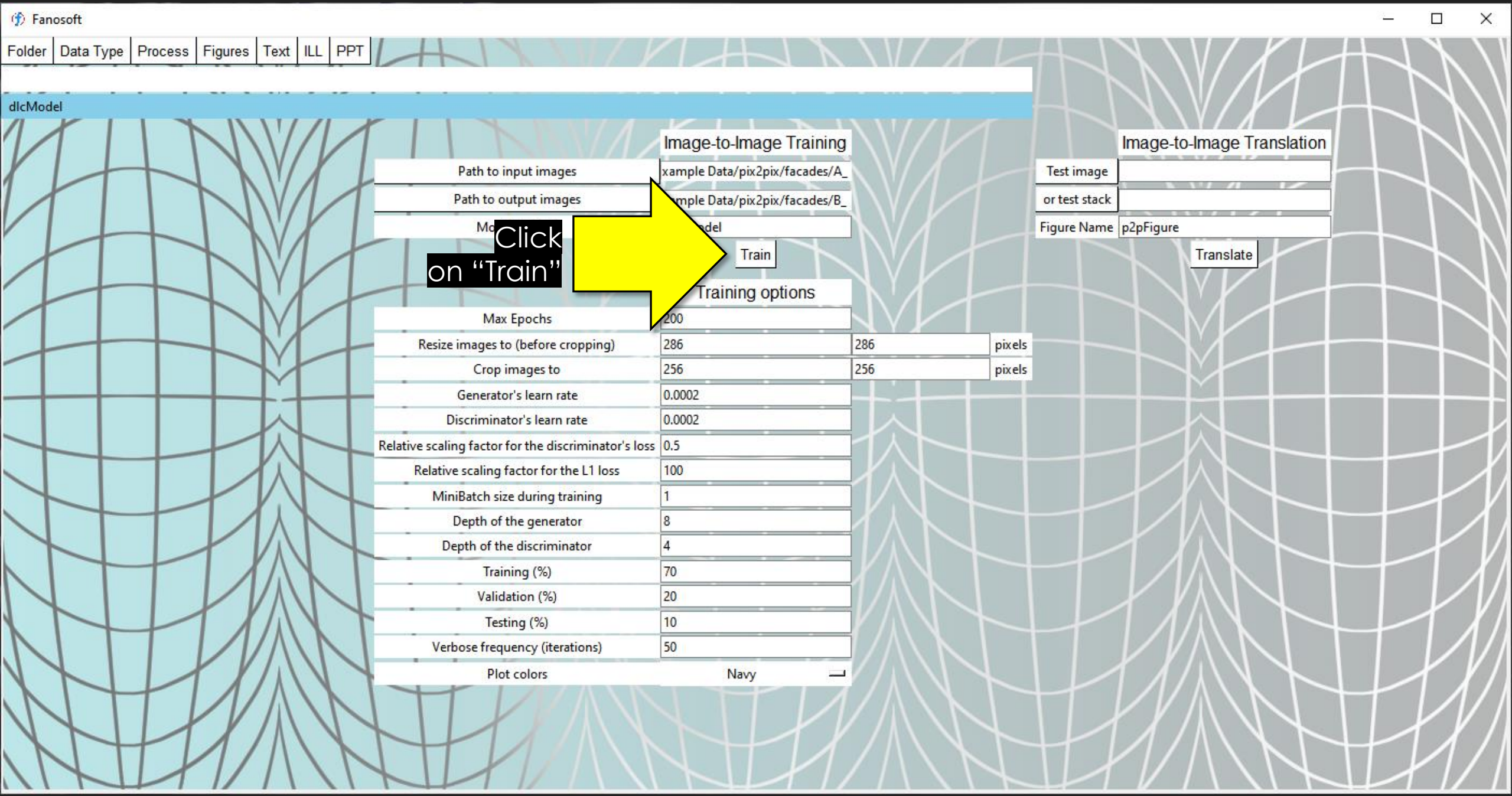
Data (D:)
Google Drive (G:)
Upwork (T:)
No items match your search.
Folder:
Select Folder
Cancel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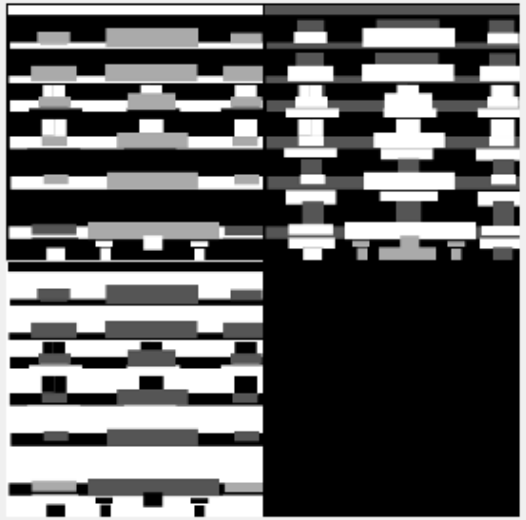
Validation (%)
20
Testing (%)
10
Verbose frequency (iterations)
50
Plot colors
Navy
Image-to-Image Translation
Test image
or test stack
Figure Name
p2pFigure
Translate

pix2pix training started at 17-Nov-2023 15:26:35

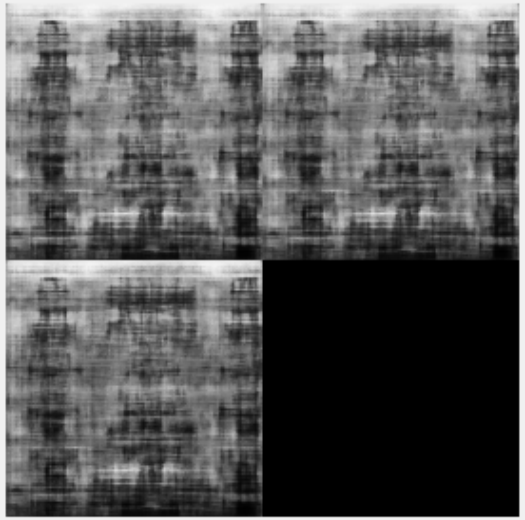
File Edit View Insert Tools Desktop Win

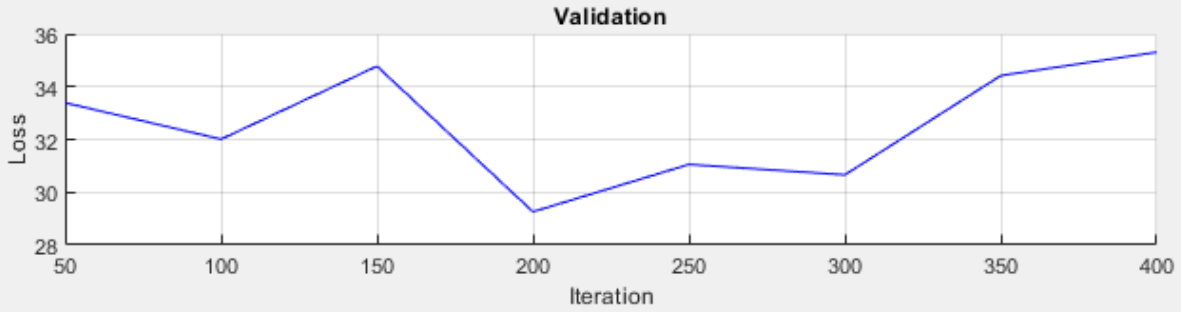
4 images from the validation dataset

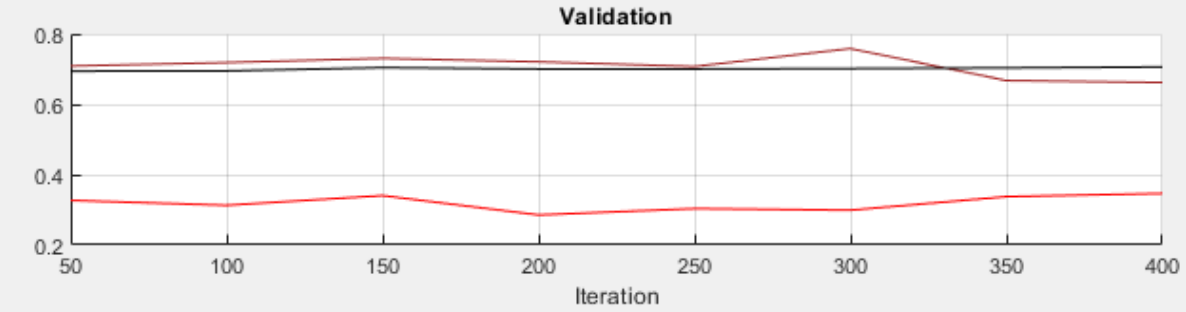


Example of translation

Same 4 images translated by pix2pix







ChatGPT

Generate scientific publications templates from keywords

ChatGPT

- ChatGPT used to generate scientific publications templates from keywords!
- Format compatible with major journals (e.g. Nature Communications)
- Enter the desired keywords or select values in drop down menus
- Optionally select the figures to insert in the publication

ChatGPT Example – Scientific Paper

Chapter 1. Abstract

In this interpretation, we examine the capability of [microscopy](method) to [quantify myelination](method_process) at the individual [mechanical signaling](biological_process) point. We have shared the preliminary outcomes showing the potential of [quantitative phase imaging](methodology1) for [Gabor's holography](methodology2) and rapidly achieving [differential diagnosis](methodology3). Registering the developments of [immunofluorescent images](process_results) with [dry mass videos](process) permits the assessment of [expression of proteins](biological_process1) all through the span of [remyelination](biological_process2). To start the process of [quantitative phase imaging](methodology1) based on [Gabor's holography](methodology2), we carried out a [qualitative evaluation](process_assessment) of our unlabeled photos. Initial research has revealed that the closeness and interaction of [matrix](biological_structure1) plays a part in normal [B16 F10s cells](biological_structure2). Significant [mechanical signaling](biological_process) difference in [anterior commissure](biological_structure) was reported and notably high [anterior commissure](biological_structure) was observed in [patient cohort](study_process). In conclusion, [anterior commissure](biological_structure) may offer greater medically valuable data on [solid tumors](disease) and highlights the important role of [stroma-cancer interactions](disease_connections). These results will provide insight on the details of the [mechanical signaling](biological_process) when we increase the sensitivity and reliability of [quantitative phase imaging](methodology1) in [Gabor's holography](methodology2) and [brain tissues](biological_structures).

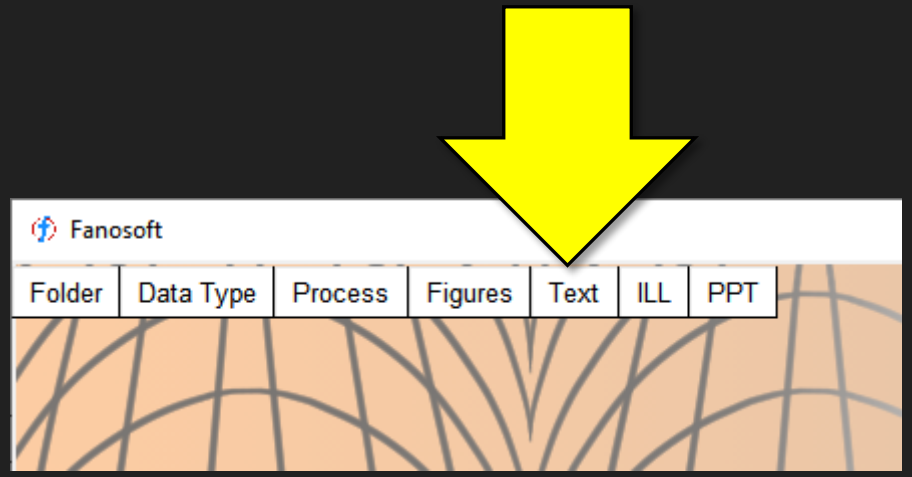
ChatGPT Example – Scientific Paper

Chapter 2. Introduction

[breast cancer](disease_type) is the second most common form of [solid tumors](disease) detected across the world, making up for [11.9% of all cancers](disease_statistics) discovered in [2012](year). Many [autoimmune](biological_condition) [solid tumors](disease) disorders have been linked to differences in the [expression of proteins](biological_process1) that are bound to perform [remyelination](biological_process2). [solid tumors](disease) on its own has a prevalence of [11.9% of all cancers](disease_statistics) individuals in the US. [solid tumors](disease) seems to have a [conservative estimate](statistical_term) of a national annual cost of [$6.8 billion](cost) in the healthcare industry. Its prevalence is significantly increasing globally; it is being considered as the second major reason of [solid tumors](disease) mortality in the US in [2012](year). Furthermore, the all-cause mortality is considerably higher in [solid tumors](disease) affected individuals compared to the unaffected individuals, with an average lifespan lessened by [2012](year). The biggest number of all-cause fatality is substantially larger in [malignant pancreatic tumor cases (85%)](disease_occurence) are [solid tumors](disease). [malignant melanoma](disease1) constantly considered as the most dangerous human [cancers](disease2) and is becoming the second most significant [cancer](disease3) killer by [2012](year). The [anterior

ChatGPT in Fanosoft

- Click on “Text”



Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

Write-up

Fill the keywords
or
select values in the
drop-down menus

age		N
analysis_detectors		N
analysis_features		N
analysis_method		N
analysis_result		N
analysis_type		N
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apparatus		N
apparatus_part		N
article_author_affiliations		N
article_author_emails		N
article_author_names		N
article_figures		N
article_filename		N
article_formatting		N
article_references		N
article_text_generator		N
article_title		N
assessment_procedure		N
assessment_technique		N
assessment_type		N
bad_consequence		N
bad_feature		N

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Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

Write-up

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bad_feature		N

Click Prev or Next to access others keyword pages

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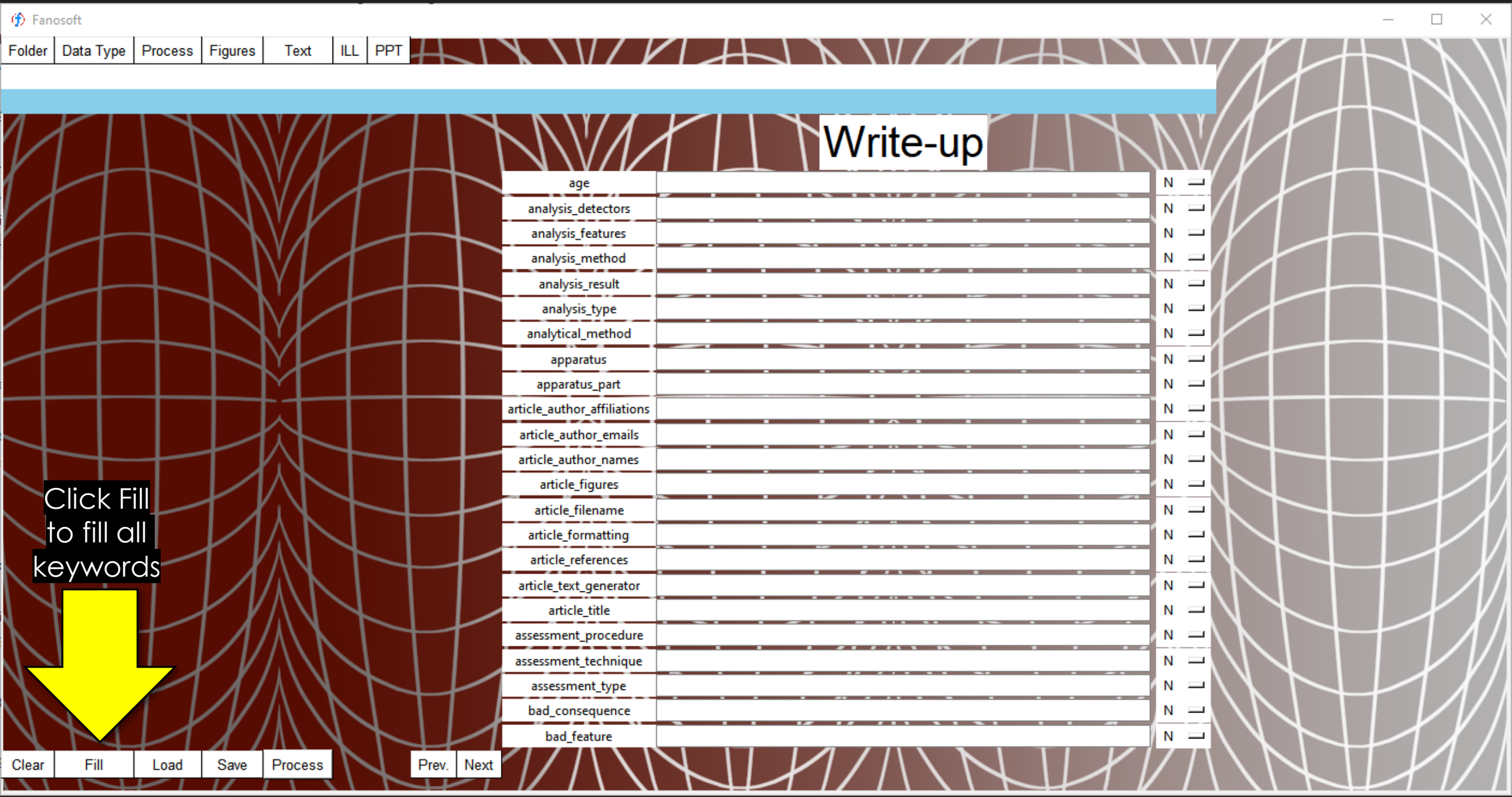
Fanosoft
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Write-up
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Click Fill to fill all keywords
Clear
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Fanosoft
Folder
Data Type
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Figures
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PPT
Write-up
chatGPT specific fields
Enter questions in natural language for chatGPT
e.g. "What is Cancer"
chatgpt_abstract1 #chatgpt_abstract1 N
chatgpt_abstract2 #chatgpt_abstract2 N
chatgpt_discussion1 #chatgpt_discussion1 N
chatgpt_discussion2 #chatgpt_discussion2 N
chatgpt_introduction1 #chatgpt_introduction1 N
chatgpt_introduction2 #chatgpt_introduction2 N
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chemical_quantity3 #chemical_quantity3 N
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chemical_technique2 #chemical_technique2 N
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cost #cost N
criterion1 #criterion1 N
criterion2 #criterion2 N
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Fanosoft

Folder | Data Type | Process | Figures | Text | ILL | PPT

Write-up

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biological_cell_exit	#biological_cell_exit	N
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biological_copies	#biological_copies	N
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biological_equipment	#biological_equipment	N
biological_examination	#biological_examination	N
biological_feature	#biological_feature	N
biological_feature1	#biological_feature1	N
biological_individual	#biological_individual	N
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biological_state2	#biological_state2	N
biological_state3	#biological_state3	N
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biological_structure	#biological_structure	N

Click Process to create the publication

Clear | Fill | Load | Save | Process

Prev. | Next

Dall.E

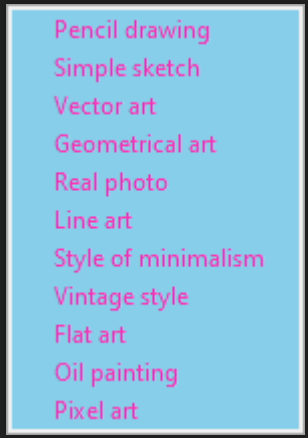
Create images, illustration and art from a description in natural language

Dall.E Examples

- Create images, illustration and art from a description in natural language
- e.g. “An oil painting by Matisse of a humanoid robot playing chess”

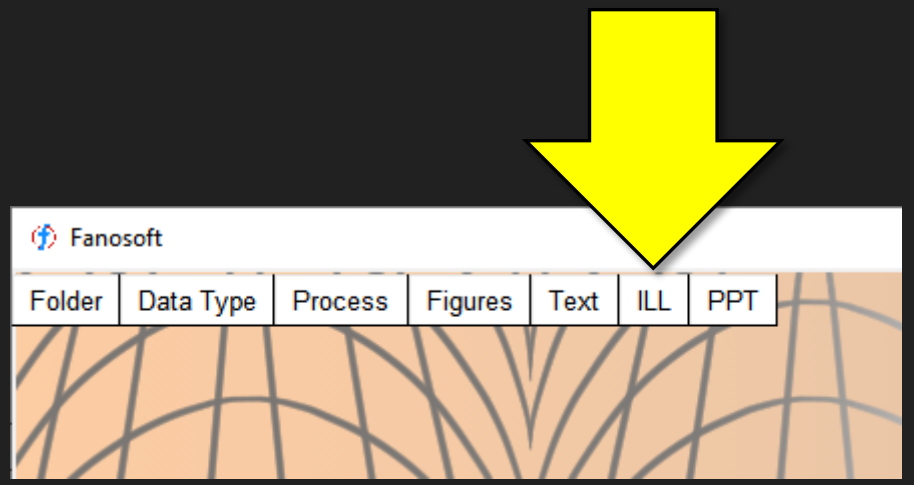
Dall.E in Fanosoft

- Can create up to 9 images per run
- Provide a description in natural language for each image
- Provide the desired type of output: Pencil drawing, Simple sketch, etc. (see right)



Dall.E in Fanosoft

- Click on “ILL”



Fanosoft

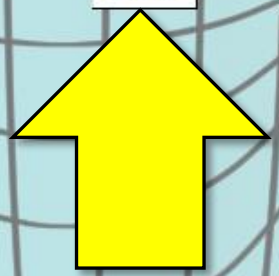
Folder | Data Type | Process | Figures | Text | ILL | PPT

ILL

a cat submarine chimera	Vector art	owl dressed a librarian	Simple sketch	cute tropical fish	Pixel art
he shape of an avocado	Oil painting	a futuristic neon lit cybo	Vector art	a photo of a white fur m	Flat art
oid robot playing chess	Geometrical art	a photo of a silhouette o	Real photo	A computer from the 90	Pencil drawing

Figure Name: illustration

SUBMIT | Preview

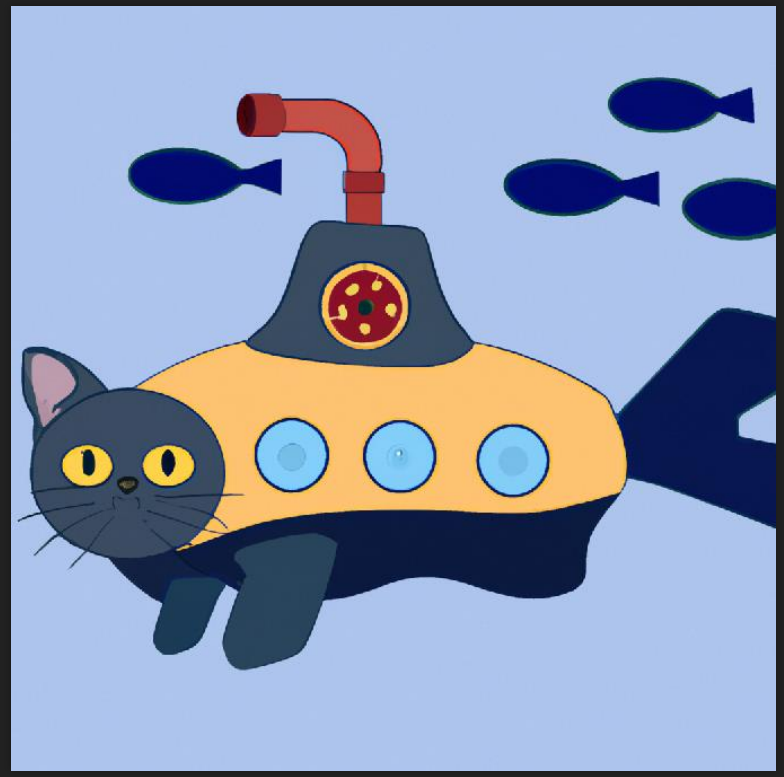


Dall.E in Fanosoft

- Preview only displays the figure on the screen.
- Submit generates a .jpeg image and a PowerPoint slide in the user's directory
  - The filename is given by the field "Figure Name"

Dall.E in Fanosoft

- “A cat submarine chimera”
- Vector Art



Dall.E in Fanosoft

- “A stern-looking owl dressed a librarian”
- Simple sketch

Dall.E in Fanosoft

- “A cute tropical fish”
- Pixel art

Dall.E in Fanosoft

- “An armchair in the shape of an avocado”
- Oil painting

Dall.E in Fanosoft

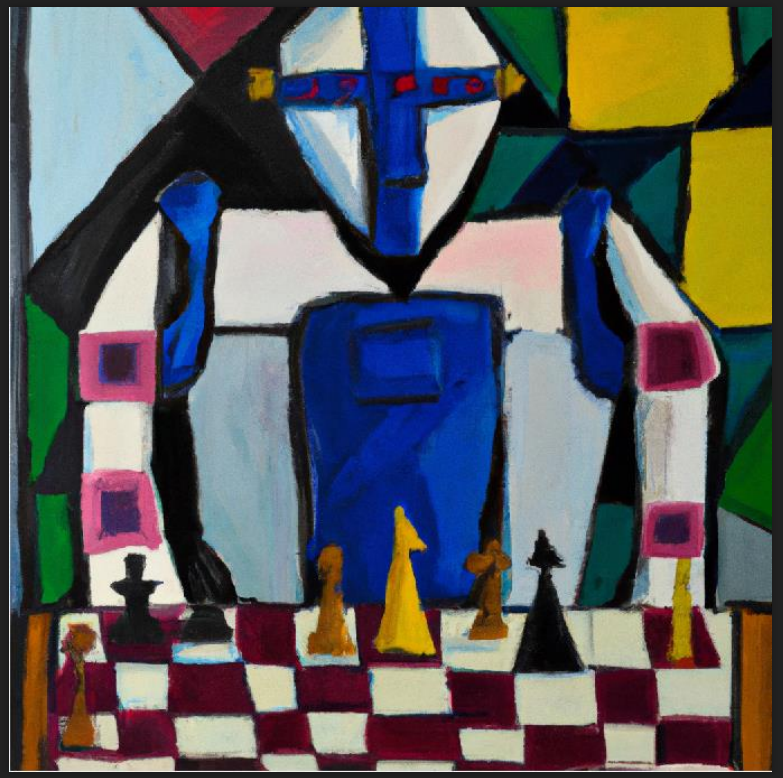
- “A futuristic neon lit cyborg face”
- Vector art

Dall.E in Fanosoft

- “A photo of a white fur monster standing in a purple room”
- Flat art

Dall.E in Fanosoft

- “An oil painting by Matisse of a humanoid robot playing chess”
- Geometrical art



Dall.E in Fanosoft

- “A photo of a silhouette of a person in a color lit desert at night”
- Real photo

Dall.E in Fanosoft

- “A computer from the 90s in the style of vaporwave”
- Pencil drawing