INFO-6147 Deep Learning With Pytorch
Fall 2024
Project Proposal

Proposal: Tiny ImageNet Classification

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Introduction

Image classification tasks are important part of computer vision which is used in various applications. This project aims to create an image classification model using convolutional neural network (CNN) and then compare its results with state of the art models available on the web. The dataset that is used in this project is Tiny ImageNet.

Objective

The objective of this project is to create a classifier with reasonable accuracy on Tiny ImageNet dataset. Additionally, transfer learning will be used to compare the model which is made from scratch to the industry state of the art models.

Dataset Description

Tiny ImageNet dataset is a group of colored images with 200 classes. The dataset contains 100,000 samples with balanced distribution of 500 images per class for training (50 for validation and 50 for testing). The images in this dataset are of size 64X64X3. The list of classes are presented in Appendix A [1].
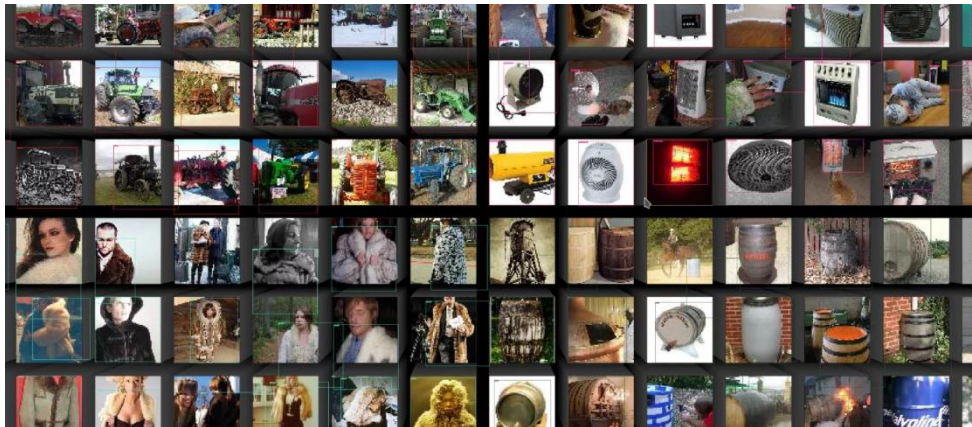

Figure 1: Tiny ImageNet sample

Methodology

The methodology for classification in this project will be conducted using CNN. CNNs can capture spatial information with filters and they would be the appropriate candidates for this task.

Multiple network designs will be studied to find an optimal design. Additionally, the results will be compared to a pretrained model (Resnet) with transfer learning.

Limitations

Since the dataset contains 200 classes and images with size of 64X64X3, computational resources may present a bottleneck in the study. Thus, in case these limitations are faced, the number of classes studied will be reduced to speed the process.

Additional Work

If time permits, the backbone of the network developed for classification task will be used to create an Autoencoder. The goal is to use the pretrained model and the Latent vectors to create masked images from the input. This will be done using the model filters to extract model activation maps which will be compared with the generated image from the decoder.

The final product should have the following network design.

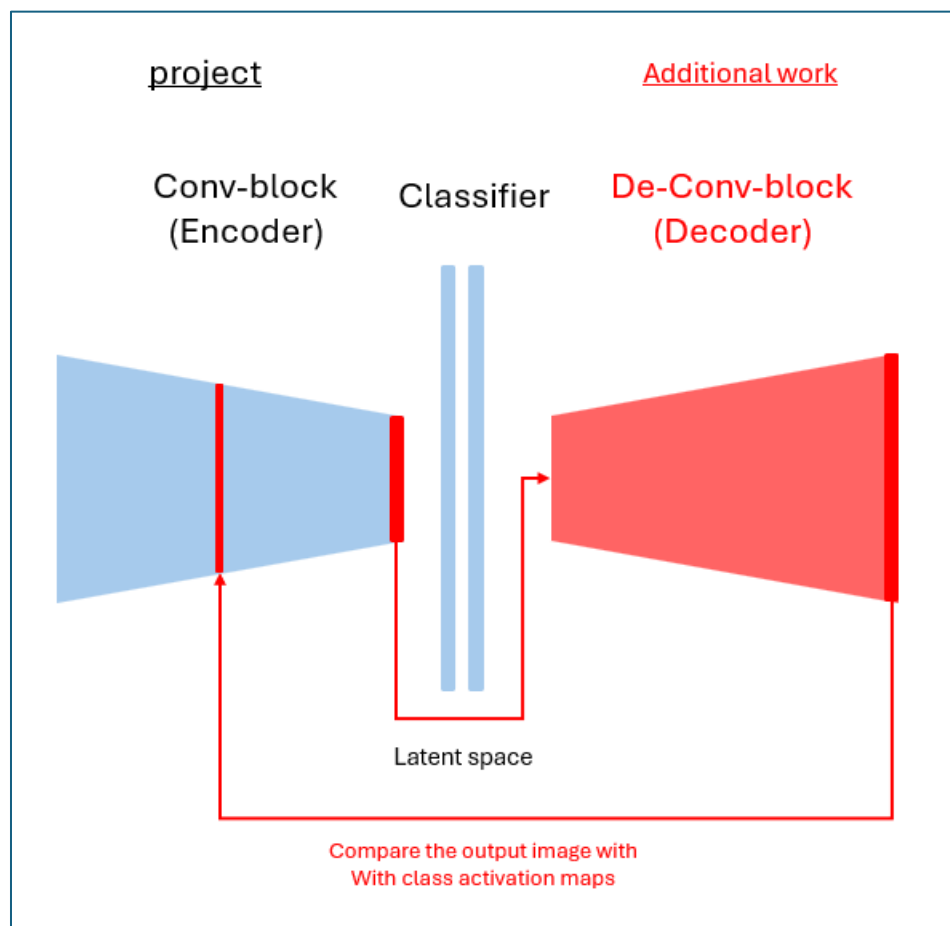*Figure 2: project network preliminary design + additional work*

Project Hosting:

The project will be hosted in the following github repository

https://github.com/m-hossni/INFO-6147-Deep-Learning.git

References:

Data source: Tiny ImageNet

[1] Data classes: Tiny-Imagenet-200/sets/words200.txt at master · rmccorm4/Tiny-Imagenet-200

Appendix A: Tiny ImageNet Classes

n01443537	goldfish, Carassius auratus
n01629819	European fire salamander, Salamandra salamandra
n01641577	bullfrog, Rana catesbeiana
n01644900	tailed frog, bell toad, ribbed toad, tailed toad, Ascaphus trui
n01698640	American alligator, Alligator mississipiensis
n01742172	boa constrictor, Constrictor constrictor
n01768244	trilobite
n01770393	scorpion
n01774384	black widow, Latrodectus mactans
n01774750	tarantula
n01784675	centipede
n01855672	goose
n01882714	koala, koala bear, kangaroo bear, native bear, Phascolarctos cinereus
n01910747	jellyfish
n01917289	brain coral
n01944390	snail
n01945685	slug
n01950731	sea slug, nudibranch
n01983481	American lobster, Northern lobster, Maine lobster, Homarus americanus
n01984695	spiny lobster, langouste, rock lobster, crawfish, crayfish, sea crawfish
n02002724	black stork, Ciconia nigra
n02056570	king penguin, Aptenodytes patagonica
n02058221	albatross, mollymawk
n02074367	dugong, Dugong dugon
n02085620	Chihuahua
n02094433	Yorkshire terrier
n02099601	golden retriever
n02099712	Labrador retriever
n02106662	German shepherd, German shepherd dog, German police dog, alsatian
n02113799	standard poodle
n02123045	tabby, tabby cat
n02123394	Persian cat
n02124075	Egyptian cat
n02125311	cougar, puma, catamount, mountain lion, painter, panther, Felis concolor
n02129165	lion, king of beasts, Panthera leo
n02132136	brown bear, bruin, Ursus arctos
n02165456	ladybug, ladybeetle, lady beetle, ladybird, ladybird beetle
n02190166	fly
n02206856	bee
n02226429	grasshopper, hopper
n02231487	walking stick, walkingstick, stick insect
n02233338	cockroach, roach
n02236044	mantis, mantid
n02268443	dragonfly, darning needle, devil's darning needle, sewing needle, snake feeder, snake doctor, mosquito hawk, skeeter hawk
n02279972	monarch, monarch butterfly, milkweed butterfly, Danaus plexippus
n02281406	sulphur butterfly, sulfur butterfly
n02321529	sea cucumber, holothurian
n02364673	guinea pig, Cavia cobaya
n02395406	hog, pig, grunter, squealer, Sus scrofa
n02403003	ox
n02410509	bison
n02415577	bighorn, bighorn sheep, cimarron, Rocky Mountain bighorn, Rocky Mountain sheep, Ovis canadensis
n02423022	gazelle

n02437312	Arabian camel, dromedary, Camelus dromedarius
n02480495	orangutan, orang, orangutang, Pongo pygmaeus
n02481823	chimpanzee, chimp, Pan troglodytes
n02486410	baboon
n02504458	African elephant, Loxodonta africana
n02509815	lesser panda, red panda, panda, bear cat, cat bear, Ailurus fulgens
n02666196	abacus
n02669723	academic gown, academic robe, judge's robe
n02699494	altar
n02730930	apron
n02769748	backpack, back pack, knapsack, packsack, rucksack, haversack
n02788148	bannister, banister, balustrade, balusters, handrail
n02791270	barbershop
n02793495	barn
n02795169	barrel, cask
n02802426	basketball
n02808440	bathtub, bathing tub, bath, tub
n02814533	beach wagon, station wagon, wagon, estate car, beach waggon, station waggon, waggon
n02814860	beacon, lighthouse, beacon light, pharos
n02815834	beaker
n02823428	beer bottle
n02837789	bikini, two-piece
n02841315	binoculars, field glasses, opera glasses
n02843684	birdhouse
n02883205	bow tie, bow-tie, bowtie
n02892201	brass, memorial tablet, plaque
n02906734	broom
n02909870	bucket, pail
n02917067	bullet train, bullet
n02927161	butcher shop, meat market
n02948072	candle, taper, wax light
n02950826	cannon
n02963159	cardigan
n02977058	cash machine, cash dispenser, automated teller machine, automatic teller machine, automated teller, automatic teller, ATM
n02988304	CD player
n02999410	chain
n03014705	chest
n03026506	Christmas stocking
n03042490	cliff dwelling
n03085013	computer keyboard, keypad
n03089624	confectionery, confectionary, candy store
n03100240	convertible
n03126707	crane
n03160309	dam, dike, dyke
n03179701	desk
n03201208	dining table, board
n03250847	drumstick
n03255030	dumbbell
n03355925	flagpole, flagstaff
n03388043	fountain
n03393912	freight car
n03400231	frying pan, frypan, skillet
n03404251	fur coat
n03424325	gasmask, respirator, gas helmet
n03444034	go-kart
n03447447	gondola
n03544143	hourglass
n03584254	iPod
n03599486	jinrikisha, ricksha, rickshaw

n03617480	kimono	n04118538	rugby ball
n03637318	lampshade, lamp shade	n04133789	sandal
n03649909	lawn mower, mower	n04146614	school bus
n03662601	lifeboat	n04149813	scoreboard
n03670208	limousine, limo	n04179913	sewing machine
n03706229	magnetic compass	n04251144	snorkel
n03733131	maypole	n04254777	sock
n03763968	military uniform	n04259630	sombrero
n03770439	miniskirt, mini	n04265275	space heater
n03796401	moving van	n04275548	spider web, spider's web
n03804744	nail	n04285008	sports car, sport car
n03814639	neck brace	n04311004	steel arch bridge
n03837869	obelisk	n04328186	stopwatch, stop watch
n03838899	oboe, hautboy, hautbois	n04356056	sunglasses, dark glasses, shades
n03854065	organ, pipe organ	n04366367	suspension bridge
n03891332	parking meter	n04371430	swimming trunks, bathing trunks
n03902125	pay-phone, pay-station	n04376876	syringe
n03930313	picket fence, paling	n04398044	teapot
n03937543	pill bottle	n04399382	teddy, teddy bear
n03970156	plunger, plumber's helper	n04417672	thatch, thatched roof
n03976657	pole	n04456115	torch
n03977966	police van, police wagon, paddy wagon, patrol wagon, wagon, black Maria	n04465501	tractor
		n04486054	triumphal arch
n03980874	poncho	n04487081 trolley	trolleybus, trolley coach, trackless trolley
n03983396	pop bottle, soda bottle		
n03992509	potter's wheel	n04501370	turnstile
n04008634	projectile, missile	n04507155	umbrella
n04023962 punchball	punching bag, punch bag, punching ball,	n04532106	vestment
		n04532670	viaduct
n04067472	reel	n04540053	volleyball
n04070727	refrigerator, icebox	n04560804	water jug
n04074963	remote control, remote	n04562935	water tower
n04099969	rocking chair, rocker	n04596742	wok

n04597913	wooden spoon	
n06596364	comic book	
n07579787	plate	
n07583066	guacamole	
n07614500	ice cream, icecream	
n07615774	ice lolly, lolly, lollipop, popsicle	
n07695742	pretzel	
n07711569	mashed potato	
n07715103	cauliflower	
n07720875	bell pepper	
n07734744	mushroom	
n07747607	orange	
n07749582	lemon	
n07753592	banana	
n07768694	pomegranate	
n07871810	meat loaf, meatloaf	
n07873807	pizza, pizza pie	
n07875152	potpie	
n07920052	espresso	
n09193705	alp	
n09246464	cliff, drop, drop-off	
n09256479	coral reef	
n09332890	lakeside, lakeshore	
n09428293	seashore, coast, seacoast, sea-coast	
n12267677	acorn	