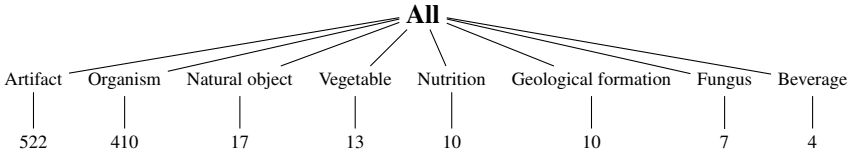
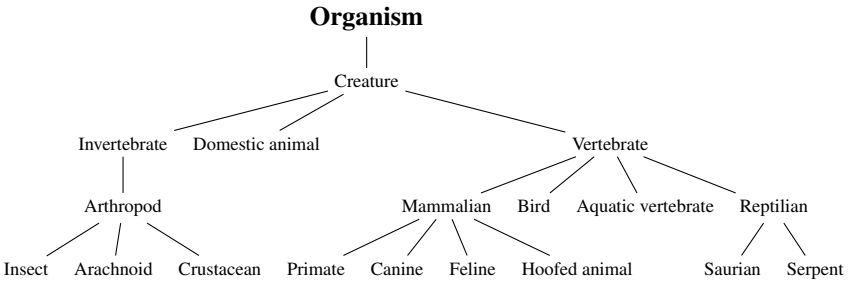
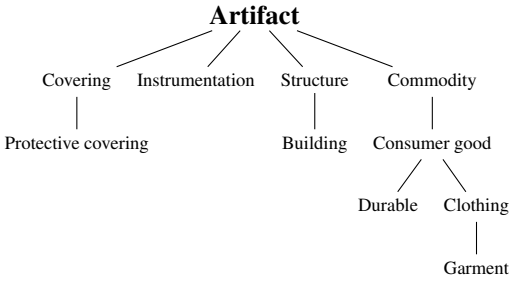
Supplemental Materials for: Evaluating Adversarial Attacks on ImageNet: A Reality Check on Misclassification Classes



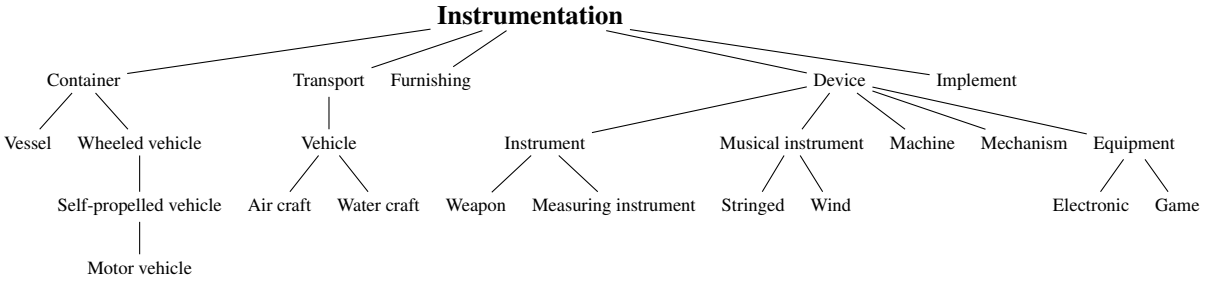
(a) Main branches of the ImageNet class hierarchy and the number of classes within those branches.



(b) ImageNet *Organism* sub-tree.



(c) ImageNet *Artifact* sub-tree.



(d) ImageNet *Instrumentation* sub-tree under *Artifact* branch.

Figure I: The ImageNet class hierarchy: (a) main branches and the number of classes that lie in those branches, (b) view of *Organism* sub-tree, (c) view of *Artifact* sub-tree, and (d) view of *Instrumentation* sub-tree.

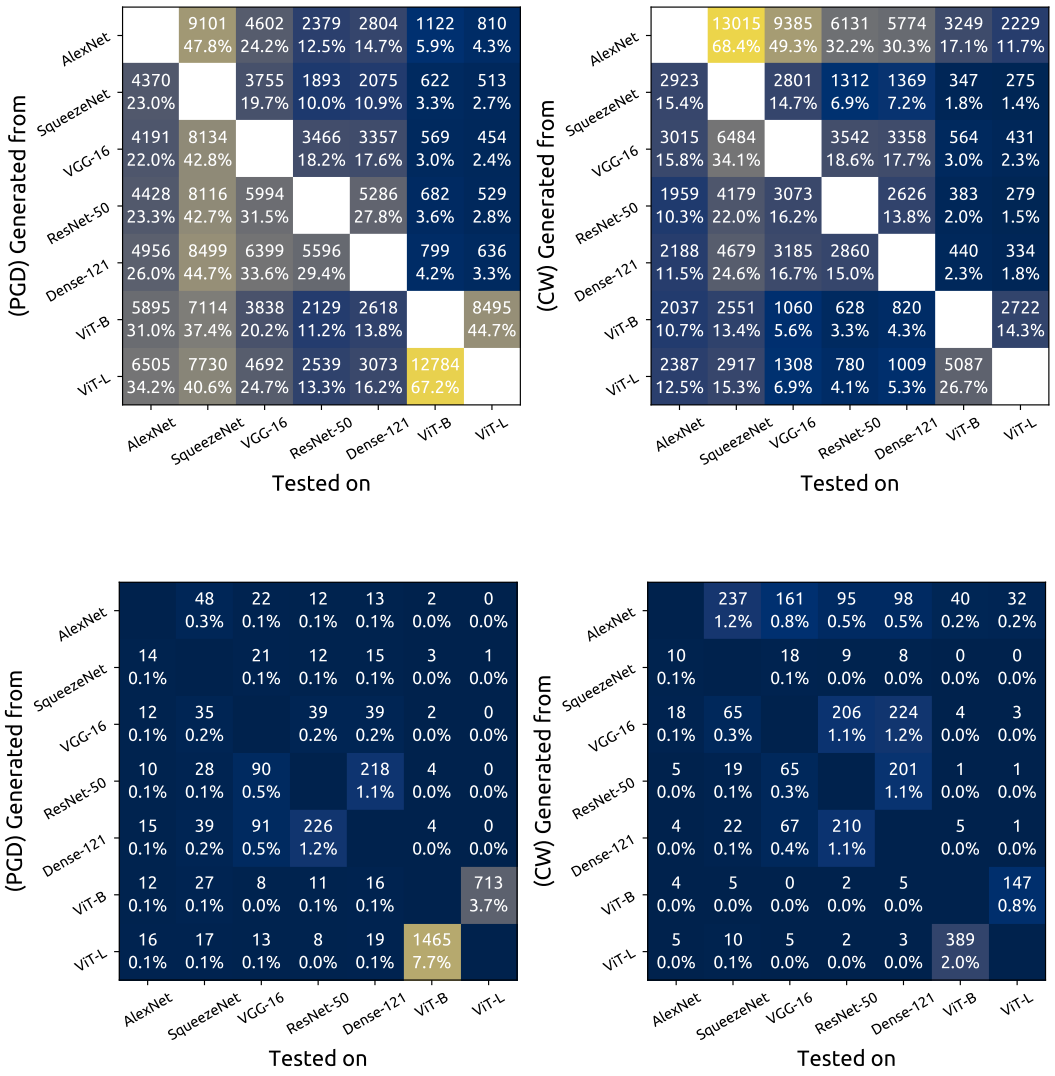


Figure II: Number (percentage) of source images that became adversarial examples with PGD (*left*) and CW (*right*). Adversarial examples are generated by the models listed along the y-axis and tested by the models listed along the x-axis. The two figures at the top display untargeted transferability successes, whereas the two figures at the bottom display targeted transferability successes.

Table I: For the adversarial examples that achieved model-to-model transferability and that have been created with **PGD** and **CW**, intra-collection misclassifications and misclassifications into the top-{3,5} prediction classes in the target models are provided. The results for the adversarial examples are grouped into collections according to the classes of their source image origins.

Hierarchy	Collection	Classes in collection	Source images in collection	Adversarial examples originating from collection	Intra-collection misclassifications		Misclassification into top-K classes	
					Count	%	Top-3	Top-5
	All	1000	19,025	289,244	289,244	100.0%	59.6%	71.1%
1	Organism	410	9,390	147,621	132,865	**90.0%**	61.2%	72.8%
1.1	Creature	398	9,009	143,996	130,409	**90.6%**	61.4%	73.1%
1.1.1	Domesticated animal	123	2,316	50,036	41,978	**83.9%**	63.4%	75.6%
1.1.2	Vertebrate	337	7,692	126,913	112,828	**88.9%**	61.3%	73.2%
1.1.2.1	Mammalian	218	4,665	89,004	76,351	**85.8%**	61.4%	73.5%
1.1.2.1.1	Primate	20	475	9,333	5,301	**56.8%**	58.9%	70.4%
1.1.2.1.2	Hoofed mammal	17	419	6,206	2,751	44.3%	58.4%	71.6%
1.1.2.1.3	Feline	13	319	3,895	1,998	**51.3%**	64.3%	75.9%
1.1.2.1.4	Canine	130	2,502	53,294	45,089	**84.6%**	63.5%	75.7%
1.1.2.2	Aquatic vertebrate	16	366	5,355	2,383	44.5%	65.0%	75.6%
1.1.2.3	Bird	59	1,937	22,402	15,993	**71.4%**	59.8%	71.3%
1.1.2.4	Reptilian	36	547	7,635	4,795	**62.8%**	63.8%	75.2%
1.1.2.4.1	Saurian	11	188	2,416	1,050	43.5%	58.4%	71.1%
1.1.2.4.2	Serpent	17	223	3,202	1,700	**53.1%**	67.0%	77.1%
1.1.3	Invertebrate	61	1,317	17,083	10,698	**62.6%**	61.9%	72.3%
1.1.3.1	Arthropod	47	1,018	13,200	8,863	**67.1%**	63.1%	73.5%
1.1.3.1.1	Insect	27	652	7,850	4,468	**56.9%**	59.9%	70.5%
1.1.3.1.2	Arachnoid	9	189	2,824	1,476	**52.3%**	69.7%	79.5%
1.1.3.1.3	Crustacean	9	137	2,035	955	46.9%	70.0%	80.1%
2	Artifact	522	8,397	119,957	107,081	**89.3%**	58.6%	70.2%
2.1	Commodity	63	906	16,092	5,411	33.6%	55.5%	68.6%
2.1.1	Consumer Good	62	896	15,923	5,205	32.7%	55.5%	68.6%
2.1.1.1	Clothing	49	670	12,010	4,660	38.8%	57.5%	70.8%
2.1.1.1.1	Garment	24	295	6,218	1,455	23.4%	56.4%	70.7%
2.1.1.2	Durable	13	226	3,913	331	8.5%	49.6%	61.8%
2.2	Covering	90	1,287	20,928	9,182	43.9%	59.4%	71.9%
2.2.1	Protective covering	27	407	6,021	766	12.7%	64.6%	75.7%
2.3	Instrumentation	353	5,963	80,638	55,364	**68.7%**	58.0%	69.7%
2.3.1	Container	99	1,528	20,779	10,701	**51.5%**	62.9%	73.5%
2.3.1.1	Vessel	23	261	4,515	1,373	30.4%	57.2%	67.9%
2.3.1.2	Wheeled vehicle	43	879	9,288	5,445	**58.6%**	70.4%	80.0%
2.3.1.2.1	Self-propelled vehicle	31	627	6,761	3,336	49.3%	69.5%	79.7%
2.3.1.2.1.1	Motor vehicle	22	400	4,654	2,198	47.2%	67.6%	79.3%
2.3.2	Transport	71	1,558	17,929	10,643	**59.4%**	64.5%	75.2%
2.3.2.1	Vehicle	66	1,439	16,790	9,439	**56.2%**	64.3%	75.0%
2.3.2.1.1	Air craft	4	101	1,885	291	15.4%	50.7%	62.2%
2.3.2.1.2	Water craft	15	367	4,400	1,854	42.1%	59.5%	72.0%
2.3.3	Device	125	1,901	24,436	8,235	33.7%	57.5%	68.7%
2.3.3.1	Instrument	28	374	4,999	1,330	26.6%	57.6%	68.7%
2.3.3.1.1	Measuring instrument	12	202	2,605	716	27.5%	57.5%	67.4%
2.3.3.1.2	Weapon	7	69	914	150	16.4%	63.6%	72.2%
2.3.3.2	Machine	14	223	2,527	496	19.6%	69.7%	80.3%
2.3.3.3	Mechanism	12	219	2,814	45	1.6%	52.4%	63.8%
2.3.3.4	Musical instrument	26	427	4,756	1,835	38.6%	63.4%	74.1%
2.3.3.4.1	Stringed instrument	8	158	1,665	515	30.9%	61.7%	72.9%
2.3.3.4.2	Wind instrument	12	188	2,080	573	27.5%	63.3%	73.8%
2.3.4	Equipment	37	738	11,470	2,379	20.7%	50.2%	63.6%
2.3.4.1	Electronic equipment	13	178	3,122	394	12.6%	52.0%	64.9%
2.3.4.2	Game equipment	13	321	3,983	763	19.2%	56.3%	67.7%
2.3.5	Furnishing	25	447	7,554	1,774	23.5%	57.2%	69.6%
2.3.6	Implement	38	409	7,452	1,657	22.2%	57.2%	69.0%
2.4	Structure	57	1,035	12,799	5,349	41.8%	62.3%	72.1%
2.4.1	Building	14	293	3,428	663	19.3%	66.0%	76.5%
3	Geological formation	10	139	3,631	1,439	39.6%	49.4%	61.2%
3.1	Natural elevation	5	65	1,705	219	12.8%	47.6%	60.1%
4	Natural object	17	379	5,734	1,700	29.6%	52.8%	63.4%
4.1	Plant	16	363	5,207	1,700	32.6%	53.7%	63.9%
4.1.1	Fruit	16	363	5,207	1,700	32.6%	53.7%	63.9%
4.1.1.1	Edible fruit	10	233	3,564	819	23.0%	49.7%	60.5%
5	Fungus	7	226	2,307	544	23.6%	56.1%	66.4%
6	Nutrition	10	157	3,017	528	17.5%	54.8%	64.1%
7	Vegetable	13	278	4,368	1,230	28.2%	56.5%	67.7%
8	Beverage	4	40	1,226	165	13.5%	64.4%	74.3%

Table II: For the adversarial examples that achieved model-to-model transferability and that have been created with **PGD**, intra-collection misclassifications and misclassifications into the top-{3,5} prediction classes in the target models are provided. The results for the adversarial examples are grouped into collections according to the classes of their source image origins.

Hierarchy	Collection	Classes in collection	Source images in collection	Adversarial examples originating from collection	Intra-collection misclassifications		Misclassification into top-K classes	
					Count	%	Top-3	Top-5
	All	1000	19,025	173,549	173,549	100.0%	59.5%	71.5%
1	Organism	410	9,390	84,734	75,882	**89.6%**	62.0%	74.0%
1.1	Creature	398	9,009	82,599	74,498	**90.2%**	62.3%	74.2%
1.1.1	Domesticated animal	123	2,316	28,385	23,898	**84.2%**	64.6%	77.2%
1.1.2	Vertebrate	337	7,692	72,329	64,258	**88.8%**	62.3%	74.5%
1.1.2.1	Mammalian	218	4,665	50,125	43,705	**87.2%**	62.9%	75.5%
1.1.2.1.1	Primate	20	475	5,123	2,999	**58.5%**	60.4%	72.5%
1.1.2.1.2	Hoofed mammal	17	419	3,460	1,541	44.5%	60.2%	74.0%
1.1.2.1.3	Feline	13	319	2,346	1,262	**53.8%**	65.9%	78.5%
1.1.2.1.4	Canine	130	2,502	30,094	25,784	**85.7%**	64.8%	77.5%
1.1.2.2	Aquatic vertebrate	16	366	3,273	1,426	43.6%	64.7%	75.4%
1.1.2.3	Bird	59	1,937	12,878	9,013	**70.0%**	60.3%	71.4%
1.1.2.4	Reptilian	36	547	4,549	2,829	**62.2%**	62.7%	75.2%
1.1.2.4.1	Saurian	11	188	1,449	610	42.1%	56.5%	70.2%
1.1.2.4.2	Serpent	17	223	1,931	1,013	**52.5%**	66.0%	77.3%
1.1.3	Invertebrate	61	1,317	10,270	6,329	**61.6%**	62.0%	72.5%
1.1.3.1	Arthropod	47	1,018	7,893	5,200	**65.9%**	63.1%	73.7%
1.1.3.1.1	Insect	27	652	4,650	2,566	**55.2%**	59.7%	70.5%
1.1.3.1.2	Arachnoid	9	189	1,700	932	**54.8%**	70.0%	80.1%
1.1.3.1.3	Crustacean	9	137	1,247	571	45.8%	70.2%	80.5%
2	Artifact	522	8,397	75,248	67,853	**90.2%**	57.7%	70.0%
2.1	Commodity	63	906	10,204	3,428	33.6%	54.7%	68.5%
2.1.1	Consumer Good	62	896	10,107	3,290	32.6%	54.7%	68.4%
2.1.1.1	Clothing	49	670	7,515	2,984	39.7%	56.8%	71.0%
2.1.1.1.1	Garment	24	295	3,877	928	23.9%	55.4%	70.6%
2.1.1.2	Durable	13	226	2,592	187	7.2%	48.3%	60.8%
2.2	Covering	90	1,287	13,113	5,846	44.6%	58.3%	71.6%
2.2.1	Protective covering	27	407	3,793	511	13.5%	63.2%	74.7%
2.3	Instrumentation	353	5,963	50,597	34,722	**68.6%**	57.1%	69.4%
2.3.1	Container	99	1,528	12,966	6,622	**51.1%**	61.8%	72.9%
2.3.1.1	Vessel	23	261	2,789	804	28.8%	55.3%	66.0%
2.3.1.2	Wheeled vehicle	43	879	5,791	3,403	**58.8%**	70.1%	80.2%
2.3.1.2.1	Self-propelled vehicle	31	627	4,262	2,126	49.9%	69.4%	80.2%
2.3.1.2.1.1	Motor vehicle	22	400	2,953	1,406	47.6%	67.7%	80.1%
2.3.2	Transport	71	1,558	11,340	6,725	**59.3%**	63.8%	75.1%
2.3.2.1	Vehicle	66	1,439	10,604	5,946	**56.1%**	63.6%	74.9%
2.3.2.1.1	Air craft	4	101	1,180	193	16.4%	49.0%	61.6%
2.3.2.1.2	Water craft	15	367	2,845	1,167	41.0%	58.9%	71.7%
2.3.3	Device	125	1,901	15,419	5,212	33.8%	56.7%	68.8%
2.3.3.1	Instrument	28	374	3,088	836	27.1%	58.0%	69.3%
2.3.3.1.1	Measuring instrument	12	202	1,624	468	28.8%	57.3%	67.4%
2.3.3.1.2	Weapon	7	69	527	86	16.3%	66.6%	74.8%
2.3.3.2	Machine	14	223	1,690	293	17.3%	67.6%	79.2%
2.3.3.3	Mechanism	12	219	1,809	29	1.6%	51.1%	63.1%
2.3.3.4	Musical instrument	26	427	2,912	1,155	39.7%	62.7%	75.2%
2.3.3.4.1	Stringed instrument	8	158	1,015	324	31.9%	61.1%	74.3%
2.3.3.4.2	Wind instrument	12	188	1,283	374	29.2%	63.0%	74.8%
2.3.4	Equipment	37	738	7,257	1,555	21.4%	49.4%	64.0%
2.3.4.1	Electronic equipment	13	178	1,947	251	12.9%	49.3%	63.5%
2.3.4.2	Game equipment	13	321	2,538	510	20.1%	57.1%	69.3%
2.3.5	Furnishing	25	447	4,697	1,067	22.7%	55.5%	68.4%
2.3.6	Implement	38	409	4,544	1,013	22.3%	56.8%	69.5%
2.4	Structure	57	1,035	7,998	3,404	42.6%	62.5%	72.8%
2.4.1	Building	14	293	2,137	431	20.2%	65.2%	76.5%
3	Geological formation	10	139	2,250	860	38.2%	46.8%	59.8%
3.1	Natural elevation	5	65	1,080	123	11.4%	44.1%	58.2%
4	Natural object	17	379	3,590	1,105	30.8%	52.2%	64.3%
4.1	Plant	16	363	3,238	1,105	34.1%	53.6%	64.8%
4.1.1	Fruit	16	363	3,238	1,105	34.1%	53.6%	64.8%
4.1.1.1	Edible fruit	10	233	2,250	550	24.4%	49.0%	61.1%
5	Fungus	7	226	1,320	295	22.3%	55.4%	65.9%
6	Nutrition	10	157	1,895	340	17.9%	53.9%	63.9%
7	Vegetable	13	278	2,814	772	27.4%	56.1%	68.0%
8	Beverage	4	40	767	93	12.1%	61.4%	71.7%

Table III: For the adversarial examples that achieved model-to-model transferability and that have been created with **CW**, intra-collection misclassifications and misclassifications into the top-{3,5} prediction classes in the target models are provided. The results for the adversarial examples are grouped into collections according to the classes of their source image origins.

Hierarchy	Collection	Classes in collection	Source images in collection	Adversarial examples originating from collection	Intra-collection misclassifications		Misclassification into top-K classes	
					Count	%	Top-3	Top-5
	All	1000	19,025	115,695	115,695	100.0%	59.8%	70.5%
1	Organism	410	9,390	62,887	56,983	**90.6%**	60.1%	71.3%
1.1	Creature	398	9,009	61,397	55,911	**91.1%**	60.2%	71.5%
1.1.1	Domesticated animal	123	2,316	21,651	18,080	**83.5%**	61.8%	73.5%
1.1.2	Vertebrate	337	7,692	54,584	48,570	**89.0%**	60.0%	71.4%
1.1.2.1	Mammalian	218	4,665	38,879	32,646	**84.0%**	59.6%	71.0%
1.1.2.1.1	Primate	20	475	4,210	2,302	**54.7%**	57.1%	67.8%
1.1.2.1.2	Hoofed mammal	17	419	2,746	1,210	44.1%	56.2%	68.6%
1.1.2.1.3	Feline	13	319	1,549	736	47.5%	61.9%	72.0%
1.1.2.1.4	Canine	130	2,502	23,200	19,305	**83.2%**	61.8%	73.5%
1.1.2.2	Aquatic vertebrate	16	366	2,082	957	46.0%	65.6%	75.9%
1.1.2.3	Bird	59	1,937	9,524	6,980	**73.3%**	59.2%	71.1%
1.1.2.4	Reptilian	36	547	3,086	1,966	**63.7%**	65.4%	75.1%
1.1.2.4.1	Saurian	11	188	967	440	45.5%	61.4%	72.4%
1.1.2.4.2	Serpent	17	223	1,271	687	**54.1%**	68.5%	76.8%
1.1.3	Invertebrate	61	1,317	6,813	4,369	**64.1%**	61.8%	72.1%
1.1.3.1	Arthropod	47	1,018	5,307	3,663	**69.0%**	63.0%	73.3%
1.1.3.1.1	Insect	27	652	3,200	1,902	**59.4%**	60.2%	70.5%
1.1.3.1.2	Arachnoid	9	189	1,124	544	48.4%	69.3%	78.6%
1.1.3.1.3	Crustacean	9	137	788	384	48.7%	69.7%	79.4%
2	Artifact	522	8,397	44,709	39,228	**87.7%**	60.1%	70.5%
2.1	Commodity	63	906	5,888	1,983	33.7%	56.9%	68.8%
2.1.1	Consumer Good	62	896	5,816	1,915	32.9%	57.1%	68.9%
2.1.1.1	Clothing	49	670	4,495	1,676	37.3%	58.5%	70.4%
2.1.1.1.1	Garment	24	295	2,341	527	22.5%	58.1%	70.9%
2.1.1.2	Durable	13	226	1,321	144	10.9%	52.2%	63.7%
2.2	Covering	90	1,287	7,815	3,336	42.7%	61.1%	72.4%
2.2.1	Protective covering	27	407	2,228	255	11.4%	66.9%	77.4%
2.3	Instrumentation	353	5,963	30,041	20,642	**68.7%**	59.7%	70.1%
2.3.1	Container	99	1,528	7,813	4,079	**52.2%**	64.6%	74.4%
2.3.1.1	Vessel	23	261	1,726	569	33.0%	60.4%	71.0%
2.3.1.2	Wheeled vehicle	43	879	3,497	2,042	**58.4%**	71.1%	79.5%
2.3.1.2.1	Self-propelled vehicle	31	627	2,499	1,210	48.4%	69.8%	78.8%
2.3.1.2.1.1	Motor vehicle	22	400	1,701	792	46.6%	67.4%	78.0%
2.3.2	Transport	71	1,558	6,589	3,918	**59.5%**	65.7%	75.4%
2.3.2.1	Vehicle	66	1,439	6,186	3,493	**56.5%**	65.5%	75.2%
2.3.2.1.1	Air craft	4	101	705	98	13.9%	53.5%	63.1%
2.3.2.1.2	Water craft	15	367	1,555	687	44.2%	60.6%	72.7%
2.3.3	Device	125	1,901	9,017	3,023	33.5%	58.9%	68.6%
2.3.3.1	Instrument	28	374	1,911	494	25.9%	56.9%	67.8%
2.3.3.1.1	Measuring instrument	12	202	981	248	25.3%	57.8%	67.4%
2.3.3.1.2	Weapon	7	69	387	64	16.5%	59.4%	68.7%
2.3.3.2	Machine	14	223	837	203	24.3%	74.0%	82.6%
2.3.3.3	Mechanism	12	219	1,005	16	1.6%	54.7%	65.1%
2.3.3.4	Musical instrument	26	427	1,844	680	36.9%	64.5%	72.4%
2.3.3.4.1	Stringed instrument	8	158	650	191	29.4%	62.8%	70.8%
2.3.3.4.2	Wind instrument	12	188	797	199	25.0%	63.7%	72.3%
2.3.4	Equipment	37	738	4,213	824	19.6%	51.7%	62.8%
2.3.4.1	Electronic equipment	13	178	1,175	143	12.2%	56.4%	67.2%
2.3.4.2	Game equipment	13	321	1,445	253	17.5%	54.9%	64.8%
2.3.5	Furnishing	25	447	2,857	707	24.7%	60.0%	71.6%
2.3.6	Implement	38	409	2,908	644	22.1%	57.9%	68.3%
2.4	Structure	57	1,035	4,801	1,945	40.5%	62.2%	71.0%
2.4.1	Building	14	293	1,291	232	18.0%	67.4%	76.4%
3	Geological formation	10	139	1,381	579	41.9%	53.8%	63.4%
3.1	Natural elevation	5	65	625	96	15.4%	53.8%	63.2%
4	Natural object	17	379	2,144	595	27.8%	53.7%	61.9%
4.1	Plant	16	363	1,969	595	30.2%	53.9%	62.3%
4.1.1	Fruit	16	363	1,969	595	30.2%	53.9%	62.3%
4.1.1.1	Edible fruit	10	233	1,314	269	20.5%	50.9%	59.5%
5	Fungus	7	226	987	249	25.2%	57.1%	67.2%
6	Nutrition	10	157	1,122	188	16.8%	56.3%	64.4%
7	Vegetable	13	278	1,554	458	29.5%	57.3%	67.3%
8	Beverage	4	40	459	72	15.7%	69.5%	78.6%

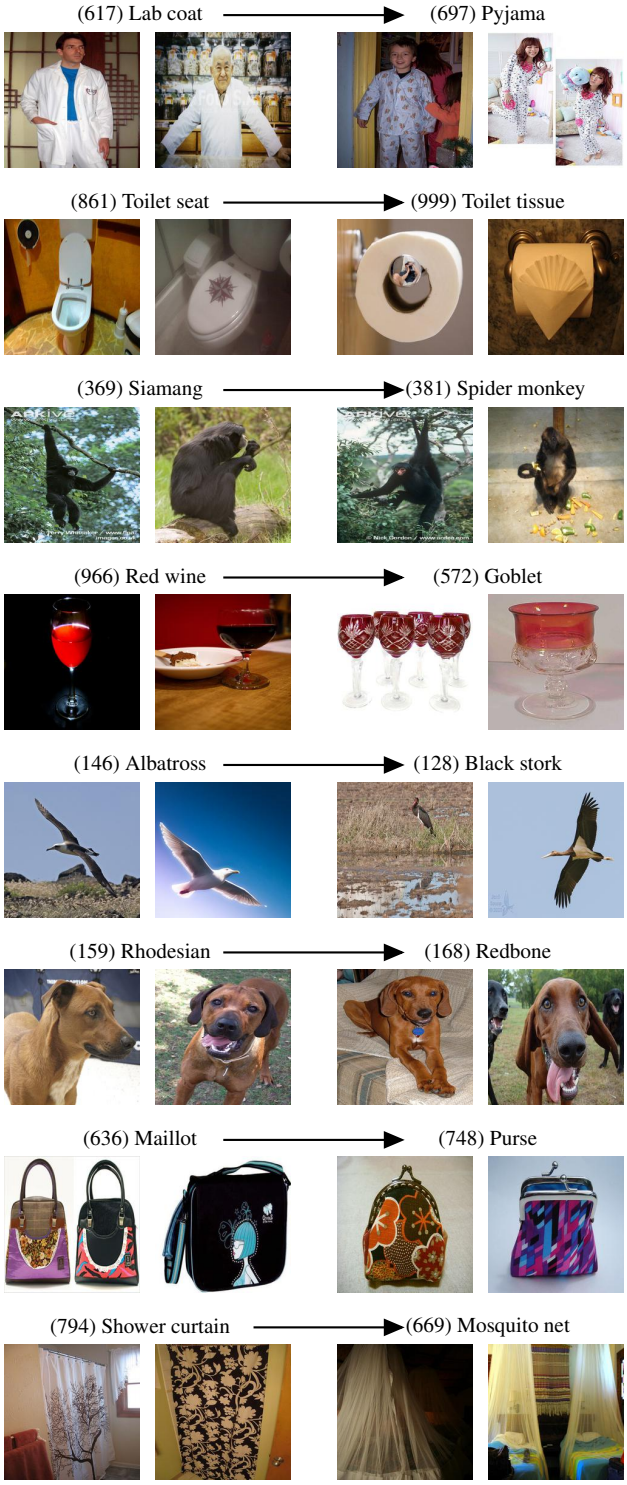


Figure III: Adversarial examples on the left are misclassified into the classes on the right by multiple models used in this study. The classes given on the right often lie in the top-5 predictions for the genuine source image counterparts of those adversarial examples.

Table IV: For the adversarial examples that achieved model-to-model transferability and that have been created with **PGD** and **CW**, intra-collection misclassifications and misclassifications into the top-{3,5} prediction classes in the target models are provided for each model employed in this study (1st column). The results for the adversarial examples are grouped into collections according to the classes of their source image origins. The results are provided for a number of collections that lie under the **Organism** sub-tree.

Model	Hierarchy	Collection	Classes in collection	Source images in collection	Adversarial examples originating from collection	Intra-collection misclassifications		Misclassification into top-K classes	
						Count	%	Top-3	Top-5
AlexNet	1	Organism	410	9,390	23,841	21,977	**92.2%**	76.0%	86.8%
	1.1.2.1.1	Primate	20	475	1,587	755	47.6%	78.3%	88.6%
	1.1.2.1.2	Hoofed mammal	17	419	1,044	420	40.2%	70.1%	86.9%
	1.1.2.1.3	Feline	13	319	781	354	45.3%	74.6%	89.2%
	1.1.2.1.4	Canine	130	2,502	8,709	7,112	**81.7%**	77.2%	87.7%
	1.1.2.2	Aquatic vertebrate	16	366	721	313	43.4%	84.6%	92.8%
	1.1.2.3	Bird	59	1,937	3,841	2,732	**71.1%**	74.2%	85.1%
	1.1.2.4	Reptilian	36	547	1,415	832	**58.8%**	73.5%	86.1%
	1.1.3	Invertebrate	61	1,317	2,620	1,740	**66.4%**	75.6%	84.9%
SqueezeNet	1	Organism	410	9,390	41,266	36,530	**88.5%**	62.5%	75.4%
	1.1.2.1.1	Primate	20	475	2,589	1,235	47.7%	61.7%	73.7%
	1.1.2.1.2	Hoofed mammal	17	419	1,909	699	36.6%	60.9%	74.5%
	1.1.2.1.3	Feline	13	319	1,267	563	44.4%	62.7%	76.0%
	1.1.2.1.4	Canine	130	2,502	13,931	11,172	**80.2%**	63.2%	76.5%
	1.1.2.2	Aquatic vertebrate	16	366	1,459	530	36.3%	66.0%	77.9%
	1.1.2.3	Bird	59	1,937	6,850	4,476	**65.3%**	61.3%	73.6%
	1.1.2.4	Reptilian	36	547	2,349	1,348	**57.4%**	65.7%	78.2%
	1.1.3	Invertebrate	61	1,317	4,900	2,615	**53.4%**	62.1%	74.8%
VGG-16	1	Organism	410	9,390	25,580	23,658	**92.5%**	56.1%	68.7%
	1.1.2.1.1	Primate	20	475	1,589	1,051	**66.1%**	52.5%	63.6%
	1.1.2.1.2	Hoofed mammal	17	419	999	511	**51.2%**	53.6%	66.6%
	1.1.2.1.3	Feline	13	319	570	332	**58.2%**	62.3%	73.3%
	1.1.2.1.4	Canine	130	2,502	9,241	7,901	**85.5%**	58.3%	71.3%
	1.1.2.2	Aquatic vertebrate	16	366	1,017	472	46.4%	59.1%	70.9%
	1.1.2.3	Bird	59	1,937	4,085	3,200	**78.3%**	55.0%	68.6%
	1.1.2.4	Reptilian	36	547	1,096	784	**71.5%**	62.0%	75.8%
	1.1.3	Invertebrate	61	1,317	2,969	1,933	**65.1%**	57.5%	67.7%
DenseNet-121	1	Organism	410	9,390	16,477	15,181	**92.1%**	64.3%	75.3%
	1.1.2.1.1	Primate	20	475	1,019	697	**68.4%**	61.7%	73.7%
	1.1.2.1.2	Hoofed mammal	17	419	650	335	**51.5%**	59.5%	72.2%
	1.1.2.1.3	Feline	13	319	248	161	**64.9%**	73.0%	79.0%
	1.1.2.1.4	Canine	130	2,502	6,150	5,596	**91.0%**	67.6%	79.9%
	1.1.2.2	Aquatic vertebrate	16	366	671	363	**54.1%**	67.1%	76.5%
	1.1.2.3	Bird	59	1,937	2,260	1,731	**76.6%**	65.7%	75.6%
	1.1.2.4	Reptilian	36	547	844	551	**65.3%**	61.5%	70.5%
	1.1.3	Invertebrate	61	1,317	1,963	1,343	**68.4%**	63.3%	72.6%
ResNet-50	1	Organism	410	9,390	17,487	15,948	91.2%	59.6%	70.8%
	1.1.2.1.1	Primate	20	475	1,232	695	**56.4%**	50.0%	62.9%
	1.1.2.1.2	Hoofed mammal	17	419	790	407	**51.5%**	54.3%	67.8%
	1.1.2.1.3	Feline	13	319	318	217	**68.2%**	70.8%	76.7%
	1.1.2.1.4	Canine	130	2,502	6,346	5,566	**87.7%**	62.4%	74.2%
	1.1.2.2	Aquatic vertebrate	16	366	694	316	45.5%	60.5%	70.2%
	1.1.2.3	Bird	59	1,937	2,568	2,140	**83.3%**	64.3%	74.4%
	1.1.2.4	Reptilian	36	547	749	520	**69.4%**	63.4%	73.2%
	1.1.3	Invertebrate	61	1,317	1,792	1,284	**71.7%**	61.6%	73.0%
Vit-Base	1	Organism	410	9,390	13,952	11,835	**84.8%**	45.6%	55.6%
	1.1.2.1.1	Primate	20	475	824	498	**60.4%**	37.3%	49.3%
	1.1.2.1.2	Hoofed mammal	17	419	490	224	45.7%	42.0%	50.6%
	1.1.2.1.3	Feline	13	319	409	209	**51.1%**	50.6%	61.9%
	1.1.2.1.4	Canine	130	2,502	5,308	4,550	**85.7%**	52.5%	64.0%
	1.1.2.2	Aquatic vertebrate	16	366	477	234	49.1%	49.5%	61.8%
	1.1.2.3	Bird	59	1,937	1,821	1,093	**60.0%**	31.6%	41.1%
	1.1.2.4	Reptilian	36	547	754	475	**63.0%**	51.9%	59.2%
	1.1.3	Invertebrate	61	1,317	1,685	1,023	**60.7%**	48.5%	57.6%
Vit-Large	1	Organism	410	9,390	9,018	7,736	**85.8%**	52.4%	62.0%
	1.1.2.1.1	Primate	20	475	493	370	**75.1%**	55.2%	63.5%
	1.1.2.1.2	Hoofed mammal	17	419	324	155	47.8%	53.4%	59.9%
	1.1.2.1.3	Feline	13	319	302	162	**53.6%**	53.0%	61.3%
	1.1.2.1.4	Canine	130	2,502	3,609	3,192	**88.4%**	56.2%	68.3%
	1.1.2.2	Aquatic vertebrate	16	366	316	155	49.1%	63.9%	71.5%
	1.1.2.3	Bird	59	1,937	977	621	**63.6%**	40.9%	49.4%
	1.1.2.4	Reptilian	36	547	428	285	**66.6%**	52.1%	61.7%
	1.1.3	Invertebrate	61	1,317	1,154	760	**65.9%**	59.2%	65.3%

Table V: For the adversarial examples that achieved model-to-model transferability and that have been created with **PGD** and **CW**, intra-collection misclassifications and misclassifications into the top-{3,5} prediction classes in the target models are provided for each model employed in this study (1st column). The results for the adversarial examples are grouped into collections according to the classes of their source image origins. The results are provided for a number of collections that lie under the **Artifact** sub-tree.

Model	Hierarchy	Collection	Classes in collection	Source images in collection	Adversarial examples originating from collection	Intra-collection misclassifications		Misclassification into top-K classes	
						Count	%	Top-3	Top-5
AlexNet	2	Artifact	522	8,397	18,149	16,341	**90.0%**	72.5%	83.8%
	2.1.1.1	Clothing	49	670	1,790	833	46.5%	67.0%	80.2%
	2.2	Covering	90	1,287	2,960	1,386	46.8%	68.4%	81.2%
	2.3.1	Container	99	1,528	3,396	1,806	**53.2%**	79.3%	86.8%
	2.3.1.2	Wheeled vehicle	43	879	1,554	927	**59.7%**	84.6%	92.9%
	2.3.3	Device	125	1,901	4,099	1,385	33.8%	71.8%	83.8%
	2.3.3.4	Musical instrument	26	427	915	402	43.9%	74.4%	86.0%
	2.3.4	Equipment	37	738	1,778	355	20.0%	63.7%	79.6%
	2.4	Structure	57	1,035	1,733	876	**50.5%**	84.2%	91.6%
SqueezeNet	2	Artifact	522	8,397	35,748	32,165	**90.0%**	58.7%	71.0%
	2.1.1.1	Clothing	49	670	3,474	1,038	29.9%	58.8%	72.4%
	2.2	Covering	90	1,287	5,963	2,240	37.6%	60.8%	73.6%
	2.3.1	Container	99	1,528	6,041	3,061	**50.7%**	60.4%	72.9%
	2.3.1.2	Wheeled vehicle	43	879	2,958	1,646	**55.6%**	66.5%	78.0%
	2.3.3	Device	125	1,901	7,781	2,282	29.3%	57.7%	70.5%
	2.3.3.4	Musical instrument	26	427	1,674	428	25.6%	62.5%	75.0%
	2.3.4	Equipment	37	738	3,732	588	15.8%	47.4%	60.9%
	2.4	Structure	57	1,035	3,344	1,573	47.0%	65.5%	76.6%
VGG-16	2	Artifact	522	8,397	20,329	18,204	**89.5%**	52.9%	66.0%
	2.1.1.1	Clothing	49	670	2,197	929	42.3%	50.2%	64.7%
	2.2	Covering	90	1,287	3,729	1,822	48.9%	53.5%	67.4%
	2.3.1	Container	99	1,528	3,272	1,758	**53.7%**	55.8%	69.8%
	2.3.1.2	Wheeled vehicle	43	879	1,221	784	**64.2%**	69.5%	81.7%
	2.3.3	Device	125	1,901	4,082	1,334	32.7%	51.4%	62.5%
	2.3.3.4	Musical instrument	26	427	697	265	38.0%	55.4%	65.6%
	2.3.4	Equipment	37	738	2,132	451	21.2%	47.0%	60.0%
	2.4	Structure	57	1,035	1,833	759	41.4%	56.9%	68.4%
DenseNet-121	2	Artifact	522	8,397	14,699	12,978	**88.3%**	60.5%	71.5%
	2.1.1.1	Clothing	49	670	1,487	593	39.9%	56.6%	70.5%
	2.2	Covering	90	1,287	2,699	1,239	45.9%	61.1%	73.1%
	2.3.1	Container	99	1,528	2,566	1,317	**51.3%**	69.9%	76.9%
	2.3.1.2	Wheeled vehicle	43	879	1,122	678	**60.4%**	76.9%	82.1%
	2.3.3	Device	125	1,901	2,963	1,163	39.3%	61.5%	72.3%
	2.3.3.4	Musical instrument	26	427	577	310	**53.7%**	69.0%	78.5%
	2.3.4	Equipment	37	738	1,246	346	27.8%	50.0%	63.0%
	2.4	Structure	57	1,035	1,700	639	37.6%	63.5%	72.4%
ResNet-50	2	Artifact	522	8,397	12,887	11,576	**89.8%**	57.7%	69.2%
	2.1.1.1	Clothing	49	670	1,352	528	39.1%	63.1%	75.3%
	2.2	Covering	90	1,287	2,376	1,112	46.8%	64.7%	76.4%
	2.3.1	Container	99	1,528	2,210	1,156	**52.3%**	62.3%	73.1%
	2.3.1.2	Wheeled vehicle	43	879	911	589	**64.7%**	73.4%	82.8%
	2.3.3	Device	125	1,901	2,285	832	36.4%	55.7%	65.9%
	2.3.3.4	Musical instrument	26	427	341	180	**52.8%**	64.5%	73.6%
	2.3.4	Equipment	37	738	1,181	242	20.5%	48.9%	62.1%
	2.4	Structure	57	1,035	1,501	561	37.4%	57.5%	68.9%
Vit-Base	2	Artifact	522	8,397	10,771	9,359	**86.9%**	47.1%	56.2%
	2.1.1.1	Clothing	49	670	1,042	454	43.6%	48.9%	60.5%
	2.2	Covering	90	1,287	1,918	837	43.6%	48.1%	59.3%
	2.3.1	Container	99	1,528	1,893	923	48.8%	49.3%	58.4%
	2.3.1.2	Wheeled vehicle	43	879	906	490	**54.1%**	54.3%	62.4%
	2.3.3	Device	125	1,901	1,998	738	36.9%	40.8%	48.7%
	2.3.3.4	Musical instrument	26	427	341	135	39.6%	46.3%	53.4%
	2.3.4	Equipment	37	738	892	247	27.7%	44.1%	54.8%
	2.4	Structure	57	1,035	1,488	539	36.2%	45.9%	53.6%
Vit-Large	2	Artifact	522	8,397	7,374	6,458	**87.6%**	54.3%	63.2%
	2.1.1.1	Clothing	49	670	668	285	42.7%	53.0%	64.7%
	2.2	Covering	90	1,287	1,283	546	42.6%	52.5%	63.0%
	2.3.1	Container	99	1,528	1,401	680	48.5%	56.7%	66.6%
	2.3.1.2	Wheeled vehicle	43	879	616	331	**53.7%**	63.1%	71.1%
	2.3.3	Device	125	1,901	1,228	501	40.8%	49.5%	57.3%
	2.3.3.4	Musical instrument	26	427	211	115	**54.5%**	59.7%	66.8%
	2.3.4	Equipment	37	738	509	150	29.5%	52.1%	62.7%
	2.4	Structure	57	1,035	1,200	402	33.5%	55.1%	63.6%