ForensicHub: A Unified Benchmark & Codebase for All-Domain Fake Image Detection and Localization

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Background & Motivation

Existing FIDL Split into Four Domains (Deepfake, IMDL, AIGC, Doc)

Causing:

- **Domain Silos** (constructs their own datasets, models, and evaluate protocols without interoperability)
  - redundant and uneven research across existing FIDL fields
  - difficulty in establishing a general and unified FIDL approach
- **Limited Real-World Applicability**
  - impossible to predetermine the type of manipulation (deepfake, imdl, aigc and document)

Experiments Setup

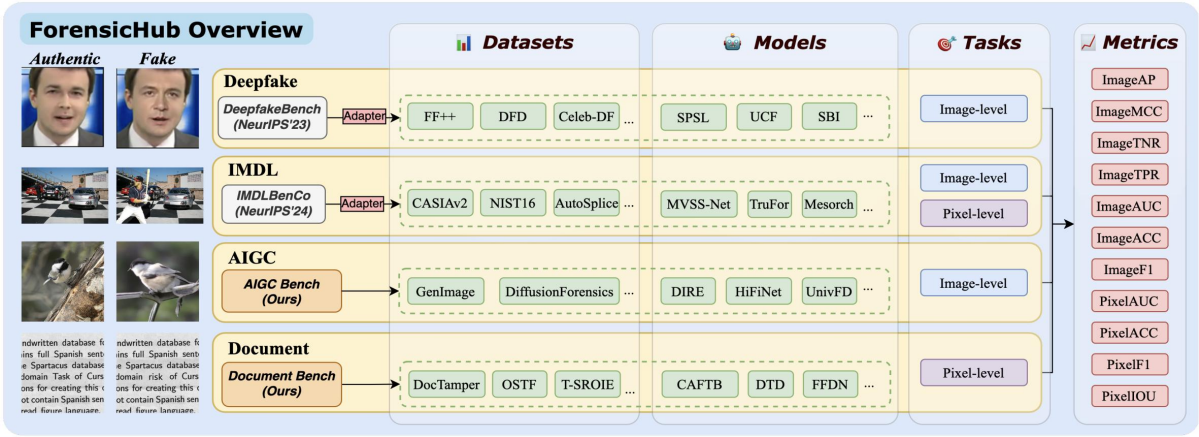
Based on ForensicHub, we conduct following experiments:

- **AIGC and Doc Benchmarks**
- **Image Forensic Fusion Protocol (IFF-Protocol)**
- **Cross Domain Experiments on Less-explored Questions**

Overview of ForensicHub Framework

Building ForensicHub Faces Two Challenges

- sufficiently extendable and flexible components to handdle the drastic variations in datasets and models across all domains
- compatibility with existing benchmarks while also addressing the scarcity of open-sourced baseline models and the absence of individual benchmarks in certain domains



Experimental Results

AIGC Benchmark and IMDL → AIGC

Method	Within-Domain	Cross-Domain								
	DiffusionForensics	ADM	BigGAN	Midjourney	VQDM	GLIDE	SD V1.4	SD V1.5	Wukong	Average$_C$
DualNet [69](APSIPA23)	1.0000	0.9986	0.9172	0.8495	0.9901	0.9835	0.8127	0.8081	0.7925	0.8902
HiFiNet [19](CVPR23)	1.0000	0.9998	0.8407	0.7210	0.9999	0.9991	0.6765	0.6747	0.6675	0.8160
Synthbuster [2](OJSP23)	0.6662	0.6226	0.8550	0.4565	0.6308	0.7719	0.4606	0.4614	0.3902	0.5762
UnivFD [45](CVPR23)	0.9947	0.8400	0.9687	0.5427	0.9663	0.9541	0.7078	0.7072	0.6781	0.7920
MVSS-Net [5](ICCV21)	0.9992	0.9706	0.9520	0.6242	0.8894	0.9380	0.7207	0.7192	0.6089	0.7997
CAT-Net [24](IJCV22)	0.9985	0.9391	0.9327	0.6423	0.8226	0.7987	0.7171	0.7142	0.6156	0.7707
Trufor [18](CVPR23)	0.9999	0.9750	0.9316	0.7079	0.9340	0.9144	0.8683	0.8687	0.8018	0.8752
IML-ViT [40](Arxiv)	1.0000	0.9594	0.9152	0.8086	0.9577	0.9464	0.8924	0.8877	0.8006	0.8957
Mesorch [83](AAAI25)	0.9998	0.9754	0.9667	0.7011	0.9331	0.9253	0.8168	0.8179	0.7441	0.8582

Doc Benchmark and IMDL → Doc

Model	Within-Domain				Cross-Domin					Average$_{All}$
	DocTamperFCD	DocTamperSCD	DocTamperTest	Average$_W$	T-SROIE	OSTF	TPIC-13	RTM	Average$_C$	
CAFTB [57](TOMM24)	0.2917	0.3770	0.3275	0.3321	0.2617	0.1194	0.3007	0.0328	0.1787	0.2444
DTD [48](CVPR25)	0.6856	0.7392	0.8031	0.7426	0.5245	0.1241	0.2835	0.0575	0.2474	0.4596
FFDN [6](ECCV24)	0.8773	0.7392	0.8212	0.8126	0.5330	0.2409	0.3572	0.0708	0.3005	0.5199
TIFDM [13](TCE24)	0.0896	0.2572	0.2585	0.2018	0.0582	0.0058	0.0134	0.0176	0.0238	0.1000
MVSS-Net [5](ICCV23)	0.2066	0.3710	0.3810	0.3195	0.1870	0.0373	0.1134	0.0268	0.0911	0.1890
PSCC-Net [34](TCSVT22)	0.3855	0.3931	0.4972	0.4253	0.5168	0.4414	0.5495	0.1255	0.4083	0.4156
Cat-Net [24](IJCV22)	0.7600	0.6405	0.7644	0.7216	0.6085	0.1777	0.3430	0.0630	0.2981	0.4796
IML-ViT [40](Arxiv)	0.4688	0.5117	0.4486	0.4764	0.4269	0.2101	0.2563	0.0764	0.2424	0.3427
Trufor [18](CVPR23)	0.2613	0.3124	0.2517	0.2751	0.2126	0.0464	0.1038	0.0342	0.0993	0.1746
Mesorch [83](AAAI25)	0.4231	0.4586	0.4651	0.4489	0.2937	0.1388	0.2408	0.0405	0.1785	0.2944

IFF-Protocol

Method	Deepfake			IMDL			AIGC		Document			Average
	FF-c40	CDFv2	DFD	Columbia	IMD2020	Autosplice	DF	GenImage	T-SROIE	OSTF	RTM	
Resnet [21](CVPR16)	0.681	0.730	0.793	0.482	0.533	0.738	0.619	0.797	0.951	0.681	0.662	0.697
Xception [8](CVPR17)	0.728	0.719	0.870	0.465	0.537	0.756	0.757	0.980	0.966	0.762	0.734	0.752
EfficientNet [61](ICML19)	0.504	0.535	0.517	0.623	0.506	0.483	0.544	0.597	0.884	0.581	0.512	0.571
Segformer [70](NIPS21)	0.691	0.748	0.862	0.409	0.562	0.824	0.805	0.998	0.980	0.866	0.736	0.771
Swin [35](ICCV21)	0.771	0.746	0.901	0.636	0.631	0.864	0.915	0.999	0.990	0.856	0.758	0.824
ConvNext [36](CVPR22)	0.794	0.784	0.911	0.625	0.598	0.825	0.895	1.000	0.994	0.849	0.762	0.822
Capsule-Net [42](ICASSP19)	0.613	0.660	0.699	0.330	0.527	0.745	0.546	0.971	0.946	0.704	0.670	0.674
RECCE [4](CVPR22)	0.634	0.602	0.727	0.506	0.492	0.642	0.684	0.906	0.542	0.688	0.555	0.634
SPSL [32](CVPR21)	0.730	0.726	0.876	0.419	0.545	0.759	0.770	0.987	0.972	0.769	0.738	0.754
Sia [60](IJCV22)	0.629	0.584	0.671	0.653	0.483	0.626	0.593	0.748	0.610	0.677	0.574	0.622
Effort [73](ICML25)	0.805	0.846	0.930	0.979	0.861	0.943	0.930	0.992	0.960	0.834	0.732	0.892
MVSS-Net [5](ICCV21)	0.713	0.700	0.857	0.298	0.539	0.795	0.671	0.994	0.978	0.806	0.741	0.736
Trufor [18](CVPR23)	0.642	0.698	0.832	0.306	0.564	0.808	0.726	0.996	0.979	0.805	0.732	0.735
IML-ViT [40](Arxiv)	0.750	0.726	0.851	0.483	0.556	0.819	0.627	0.991	0.972	0.800	0.703	0.753
Mesorch [83](AAAI25)	0.767	0.814	0.867	0.285	0.570	0.773	0.629	0.996	0.982	0.819	0.739	0.749
DualNet [69](APSIPA23)	0.637	0.552	0.540	0.268	0.517	0.748	0.899	0.988	0.935	0.658	0.657	0.673
HiFiNet [19](CVPR23)	0.587	0.611	0.648	0.745	0.534	0.677	0.575	0.756	0.937	0.663	0.615	0.668
UnivFD [45](CVPR23)	0.690	0.671	0.798	0.886	0.786	0.785	0.742	0.813	0.938	0.684	0.569	0.760
FatFormer [33](CVPR24)	0.842	0.770	0.866	0.199	0.585	0.784	0.941	0.999	0.983	0.806	0.751	0.758
CO-SPY [7](CVPR25)	0.819	0.780	0.875	0.460	0.716	0.779	0.940	0.989	0.969	0.836	0.748	0.829
DTD [48](CVPR25)	0.498	0.520	0.490	0.679	0.498	0.506	0.457	0.499	0.748	0.595	0.496	0.544
FFDN [6](ECCV24)	0.714	0.699	0.871	0.553	0.624	0.927	0.999	1.000	0.997	0.893	0.782	0.824

Doc → IMDL

Model	CASIAv1	COVERAGE	Columbia	IMD2020	NIST16	Average
CAFTB [57](TOMM24)	0.6234	0.2557	0.6731	0.3526	0.3770	0.4564
DTD [48](CVPR25)	0.3535	0.1482	0.6470	0.1749	0.1811	0.3009
FFDN [6](ECCV24)	0.5012	0.2670	0.6085	0.2516	0.2957	0.3848
TIFDM [13](TCE24)	0.3675	0.2087	0.3572	0.1634	0.2333	0.2660

IMDL → Deepfake

Model	Within Domain Evaluation							Cross Domain Evaluation						
	FF-c23	FF-c40	FF-DF	FF-F2F	FF-FS	FF-NT	Avg.	CDFv1	CDFv2	DFD	DFDC	DFDCP	Fsh	UADFV	Avg.
CAT-Net [24](IJCV22)	0.9855	0.8351	0.9946	0.9891	0.9905	0.9689	0.9606	0.7489	0.7511	0.8086	0.7196	0.7043	0.6626	0.9282	0.7605
IML-ViT [40](Arxiv)	0.9614	0.8483	0.9810	0.9728	0.9793	0.9206	0.9439	0.7250	0.7419	0.7770	0.7516	0.7237	0.6149	0.8718	0.7437
Mesorch [83](AAAI25)	0.9815	0.8445	0.9889	0.9890	0.9859	0.9636	0.9589	0.7900	0.7649	0.8468	0.7806	0.7345	0.6638	0.9623	0.7918
MVSS-Net [5](ICCV21)	0.9723	0.8140	0.9779	0.9865	0.9868	0.9458	0.9472	0.6969	0.6839	0.7749	0.6764	0.6785	0.5841	0.8871	0.7117
PSCC-Net [34](TCSVT22)	0.7147	0.6536	0.7751	0.6414	0.6460	0.6065	0.6729	0.4602	0.5898	0.5565	0.5945	0.5845	0.6574	0.8216	0.6092
Trufor [18](CVPR23)	0.7303	0.6848	0.8087	0.7687	0.7084	0.6326	0.7223	0.6551	0.6115	0.5908	0.6017	0.5749	0.5977	0.9526	0.6549

Grad-CAM Visualization