

Supplementary Table 1. Table Data sources of Hi-C contact maps (with link)

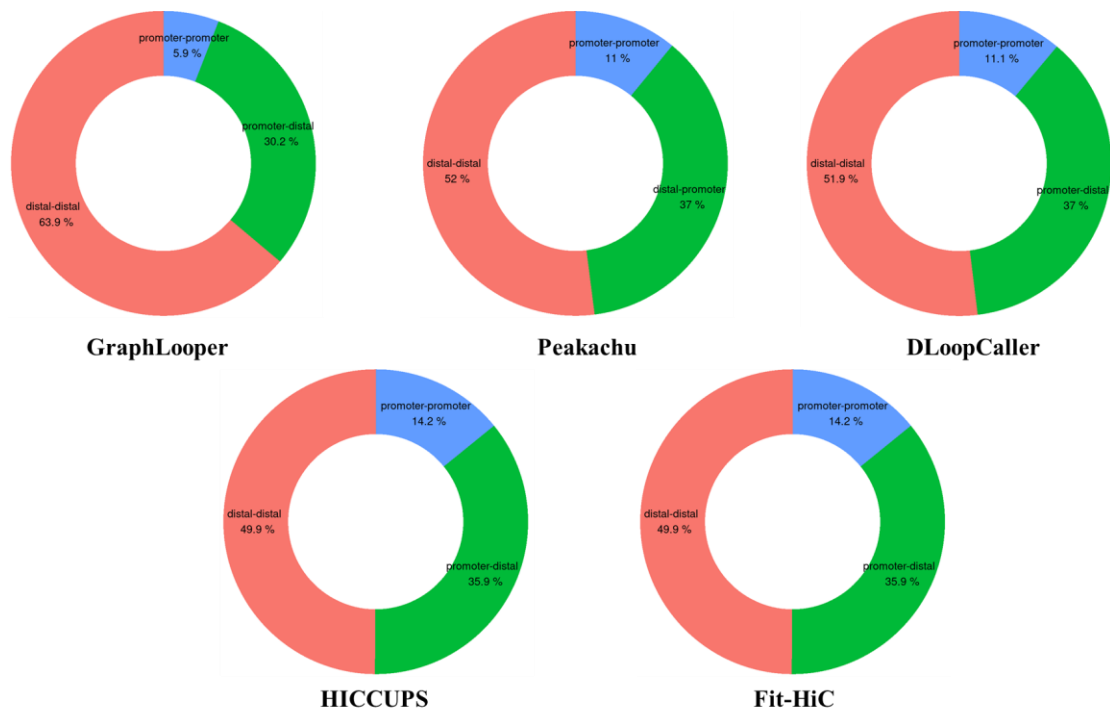
Cell line	ENCODE / 4DN Accession	link
GM12878	/	https://drive.google.com/file/d/1rfkdHSfmm5GK7qdzSwVlrSHpJVPPn5R3/view?usp=sharing
K562_replicate1	ENCFF013TGD	https://www.encodeproject.org/experiments/ENCSR545YBD/
K562_replicate2	ENCFF097SKJ	https://www.encodeproject.org/experiments/ENCSR545YBD/
H1-ESC	4DNFI6HDY7WZ	https://data.4dnucleome.org/experiment-set-replicates/4DNES2M5JIGV/

Supplementary Table 2. Data sources of epigenomic tracks (with link)

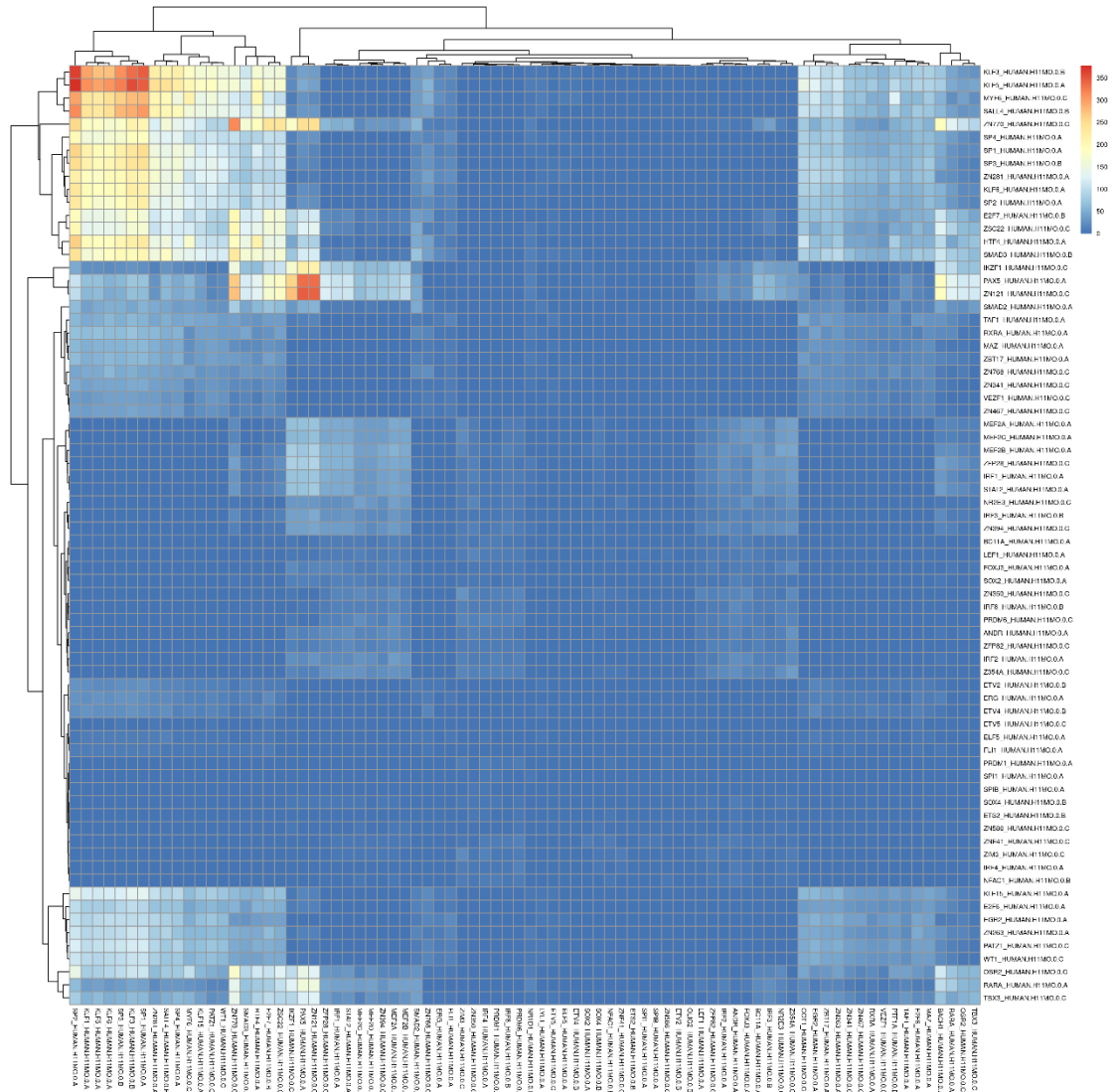
GM12878		
Type	Accession	link
DNase	ENCFF901GZH	https://www.encodeproject.org/experiments/ENCSR000EMT/
H3K4me3	ENCFF154XCY	https://www.encodeproject.org/experiments/ENCSR057BWO/
H3K27ac	ENCFF440GZA	https://www.encodeproject.org/experiments/ENCSR000AKC/
H3K27me3	ENCFF478URK	https://www.encodeproject.org/experiments/ENCSR000DRX/
H3K4me1	ENCFF372EXQ	https://www.encodeproject.org/experiments/ENCSR000AKF/
CTCF	ENCFF749HDD	https://www.encodeproject.org/experiments/ENCSR000DZN/
K562		
Type	Accession	link
DNase	ENCFF352SET	https://www.encodeproject.org/experiments/ENCSR000EKS/
H3K4me3	ENCFF285EUA	https://www.encodeproject.org/experiments/ENCSR668LDD/
H3K27ac	ENCFF010PHG	https://www.encodeproject.org/experiments/ENCSR000AKP/
H3K27me3	ENCFF552AKP	https://www.encodeproject.org/experiments/ENCSR000EWB/
H3K4me1	ENCFF444SGK	https://www.encodeproject.org/experiments/ENCSR000EWC/
CTCF	ENCFF468HJA	https://www.encodeproject.org/experiments/ENCSR000EGM/
H1-ESC		
Type	Accession	link
DNase	ENCFF232GUZ	https://www.encodeproject.org/experiments/ENCSR951BNY/
H3K4me3	ENCFF301RJN	https://www.encodeproject.org/experiments/ENCSR443YAS/
H3K27ac	ENCFF103PND	https://www.encodeproject.org/experiments/ENCSR880SUU/
H3K27me3	ENCFF395GVR	https://www.encodeproject.org/experiments/ENCSR928HYM/
H3K4me1	ENCFF164XHJ	https://www.encodeproject.org/experiments/ENCSR271TFS/
CTCF	ENCFF591SNE	https://www.encodeproject.org/experiments/ENCSR095SXC/

Supplementary Table 3. Data sources of enriched experimental data (with link)

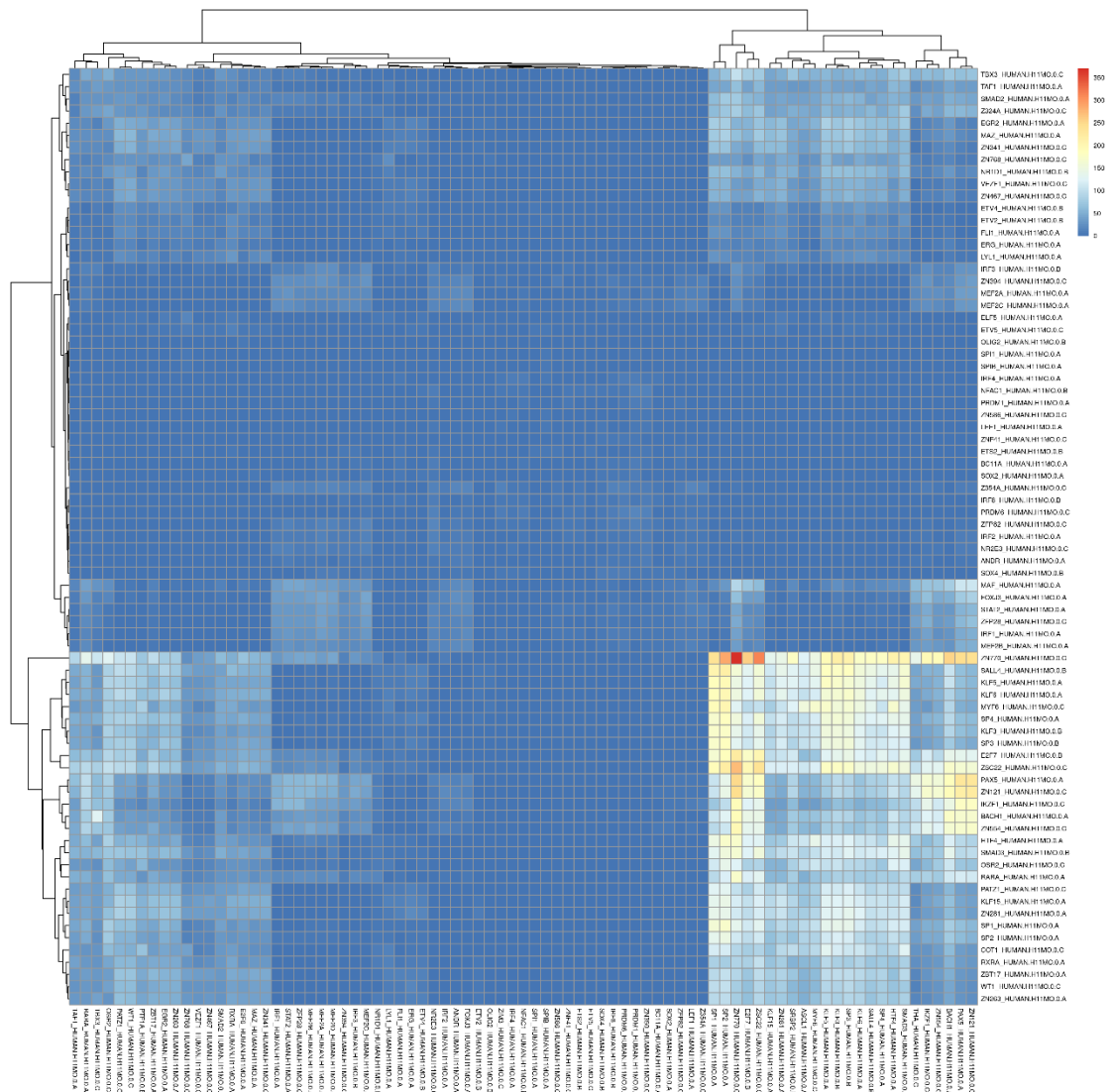
Cell line	type	Reference / ENCODE/ 4DN Accession	link
GM12878	CTCF ChIA-PET	CTCF-Mediated Human 3D Genome Architecture Reveals Chromatin Topology for Transcription	https://github.com/wangguoguo/DLooPCaller/tree/main/training-sets
	SMC1 HiChIP	HiChIP: efficient and sensitive analysis of protein-directed genome architecture	
K562	CTCF ChIA-PET	ENCFF001THV	
H1-ESC	CTCF ChIA-PET	4DNESR9S8R38	



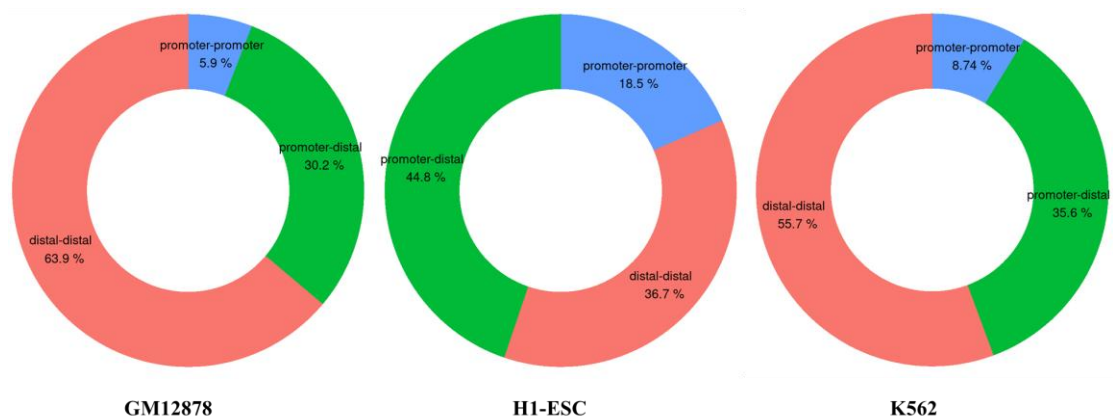
Supplementary Fig.1 The interaction classes of identified chromatin loops using CTCF ChIA-PET data after training of GM12878.



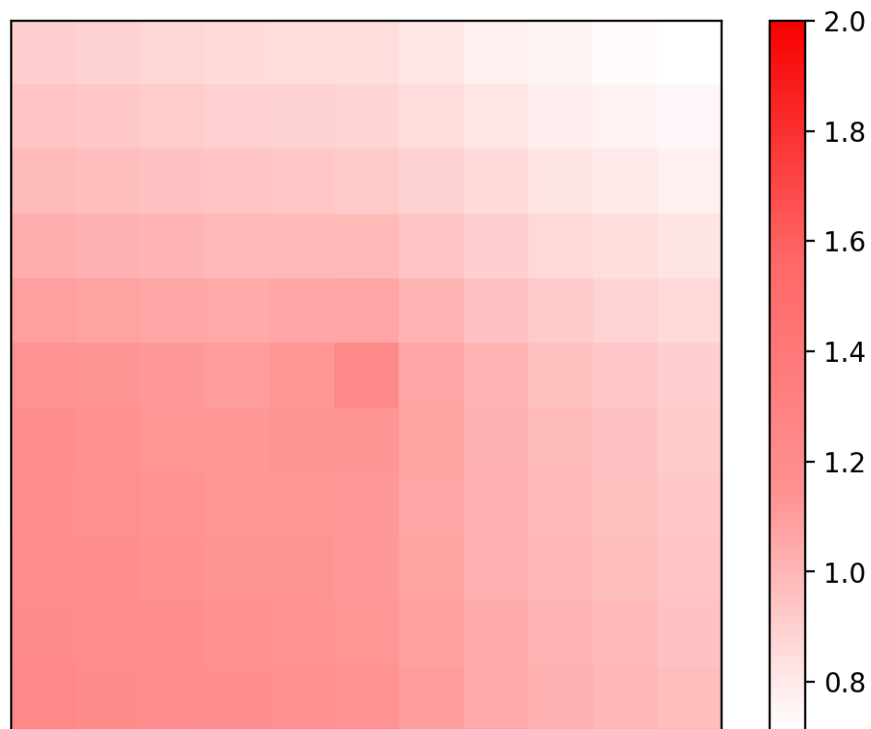
Supplementary Fig.2 The co-enrichment of transcription factor on identified chromatin loops in GM12878 with CTCF ChIA-PET training model.



Supplementary Fig.3 The co-enrichment of transcription factor on identified chromatin loops in K562(replicate1) with CTCF ChIA-PET training model.



Supplementary Fig.4 The interaction classes of identified chromatin loops using CTCF ChIA-PET data after training of GM12878, H1-ESC and K562(replicate1).



Supplementary Fig.5 APA analysis of chromatin loops identified by 0.7-downsampling in GM12878 with CTCF ChIA-PET training model.



Supplementary Fig.6 The co-enrichment of transcription factor on identified chromatin loops in 0.7 downsampling of GM12878 with CTCF ChIA-PET training model.