Feature	Objective	Input/Output	Model	Data	Feature	Training	Offline	Design
photo search	find similar photos	image -> list of images	CNN or Transformer	image + user + user-image interaction	image processing	contrastive training -> dot product + softmax + cross-entropy	mAP	indexing + repection
object detection	detect objects in photo	image -> object + location	regression -> multi-class classification: faster R-CNN	annotated dataset + images	data augmentation	convolutional layer + SRN + classifier -> NN -> regression: mean squared error + classification: cross-entropy	Intersection over union, mAP	data preprocessing + batch prediction
video search	rank videos based on query	text query -> list of videos	text encoder + video encoder	video	text data preparation + video data preparation	contrastive learning	mAP	video indexing + text indexing -> prediction
harmful content detection	predict harmful content	post -> harmful probability	early fusion -> multitask classifier	user + post + interaction	image + video + text + comments + author	dataset -> cross-entropy	ROC-AUC	detection -> enforcement
recommend video	maximize engagement	user -> videos	Collaborative Filtering + Content based filtering matrix factorization/two tower	user + video + user-video interactions	video, user, contextual, user history	Stochastic gradient descent, cross-entropy	mAP	candidate generation -> scoring -> re-ranking
recommend event	maximize event registrations	user -> list of events	LTR, GBDT or NN	user + events + friendship + interactions	location, time, social, user, event	dataset -> cross-entropy	mAP	learning pipeline + prediction pipeline
revelant ads	predict if an ad will be clicked	user -> list of ads	Deep & cross network or Deep Factorization Machines	user + ads + user-ad interactions	ads, users, clicked ads	label -> cross-entropy	cross-entropy	data preparation pipeline + continual learning pipeline + prediction pipeline
similar listings	predict listing user will click next	current viewing -> list of listings	session-based recommendation	user + listing + user-listing interaction	session data	sliding window: training data w/ negative sampling + final booked listing -> loss function w/ dot product/sigmoid/cross-entropy	average rank of the final booked listing	training pipeline + indexing pipeline + prediction pipeline
news feed	maximize reactions	user -> list of posts	multitask DNN	user + post + interaction	post, user, user-author affinity	binary cone-entropy for each binary classification task, regression loss for regression task	ROC-AUC for binary classification, mean average precision for ranking/recommendation	data preparation pipeline + prediction pipeline
recommend people	maximize number of connections	user -> list of users	Graph NN for edge prediction	user + connection + interaction	user, user-user affinity, social affinity	create snapshot -> compute nodeledge features -> create labels -> loss function	ROC-AUC for binary classification, mAP for ranking/recommendation	Generation pipeline + prediction pipeline

Problem	Framework	Model	Example
ranking	Learn To Rank	gradient-boosted decision tree	XGBoost, LightGBM
	pointwise: f(query, document) -> score	transformer	BERT
	pairwise: two items for same query -> which one is higher	neural net	two tower
	listwise: list of documents for same query -> rank		