

HYPERPARAMETERS TUNING RESULTS

BCELoss

Tuning GIN with lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.5738262338910447, Validation Accuracy: 0.9544457355927009

Epoch 1, Validation Loss: 1.1646821722203389, Validation Accuracy: 0.968798688196321

Epoch 2, Validation Loss: 0.619325004351642, Validation Accuracy: 0.9747201201784281

Epoch 3, Validation Loss: 0.6011371744181915, Validation Accuracy: 0.974734830679937

Epoch 4, Validation Loss: 0.6188000538213081, Validation Accuracy: 0.974134583946379

Epoch 5, Validation Loss: 0.5682596318775016, Validation Accuracy: 0.9745104650390555

Epoch 6, Validation Loss: 0.538902826108057, Validation Accuracy: 0.9746887500447015

Epoch 7, Validation Loss: 0.5204901406841893, Validation Accuracy: 0.9746761391649997

Epoch 8, Validation Loss: 0.5037702187415092, Validation Accuracy: 0.974798356181188

Epoch 9, Validation Loss: 0.4881391523789531, Validation Accuracy: 0.9747038178000521

Epoch 10, Validation Loss: 0.4730992476194727, Validation Accuracy:
0.9748097062579821

Epoch 11, Validation Loss: 0.45912143070407896, Validation Accuracy:
0.9747629314749341

Epoch 12, Validation Loss: 0.44746445056522455, Validation Accuracy:
0.9747085586482636

Epoch 13, Validation Loss: 0.433324870341469, Validation Accuracy: 0.9748184538704308

Epoch 14, Validation Loss: 0.4214677672380253, Validation Accuracy:
0.9748053301722904

Epoch 15, Validation Loss: 0.4102039779386213, Validation Accuracy:
0.9748553080966113

Epoch 16, Validation Loss: 0.3996048418079357, Validation Accuracy:
0.9747525195110425

Epoch 17, Validation Loss: 0.3894646510149054, Validation Accuracy:
0.9747983742205123

Epoch 18, Validation Loss: 0.37987472253756843, Validation Accuracy:
0.9747634230588428

Epoch 19, Validation Loss: 0.3707133788181002, Validation Accuracy:
0.9748102915250773

Tuning GIN with lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.7434350558309342, Validation Accuracy: 0.025678878649802825

Epoch 1, Validation Loss: 0.7128654662196157, Validation Accuracy: 0.02615758424310866

Epoch 2, Validation Loss: 0.6839522645432068, Validation Accuracy: 0.9747574353288609

Epoch 3, Validation Loss: 0.6582895833860261, Validation Accuracy: 0.9747347390312385

Epoch 4, Validation Loss: 0.6332916321588805, Validation Accuracy: 0.9747341308980524

Epoch 5, Validation Loss: 0.6107556288206843, Validation Accuracy: 0.9747965714139724

Epoch 6, Validation Loss: 0.579960466984188, Validation Accuracy: 0.9746494783706559

Epoch 7, Validation Loss: 0.5305685612463182, Validation Accuracy: 0.9748481023654639

Epoch 8, Validation Loss: 0.55681826762171, Validation Accuracy: 0.9748160825584959

Epoch 9, Validation Loss: 0.5386513417619038, Validation Accuracy: 0.9748331919850409

Epoch 10, Validation Loss: 0.5212561444520358, Validation Accuracy: 0.974805736209953

Epoch 11, Validation Loss: 0.4948842338385712, Validation Accuracy: 0.9747336214206177

Epoch 12, Validation Loss: 0.45238549197577954, Validation Accuracy: 0.9748129491073413

Epoch 13, Validation Loss: 0.4513169337738832, Validation Accuracy: 0.9747819734025432

Epoch 14, Validation Loss: 0.4317978293295238, Validation Accuracy: 0.9748471348149661

Epoch 15, Validation Loss: 0.4182325920677067, Validation Accuracy: 0.974801338864757

Epoch 16, Validation Loss: 0.4067345926025073, Validation Accuracy: 0.9746839000436881

Epoch 17, Validation Loss: 0.4339979245852004, Validation Accuracy: 0.974714329142898

Epoch 18, Validation Loss: 0.4218312050065687, Validation Accuracy: 0.9748093650611181

Epoch 19, Validation Loss: 0.41032878163434733, Validation Accuracy: 0.9747928573801026

Early stopping due to no improvement.

Tuning GIN with lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 1.3028590635425594, Validation Accuracy: 0.7253349620380616

Epoch 1, Validation Loss: 1.3314015191840587, Validation Accuracy: 0.7934742334690206
Epoch 2, Validation Loss: 1.3820282217873314, Validation Accuracy: 0.8349332284333459
Epoch 3, Validation Loss: 1.4435642164166063, Validation Accuracy: 0.9059500812559409
Early stopping due to no improvement.

Tuning GIN with lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 1.73061431266574, Validation Accuracy: 0.9747071821793054
Epoch 1, Validation Loss: 1.7201337736267885, Validation Accuracy: 0.9747850022470074
Epoch 2, Validation Loss: 1.7015788712072777, Validation Accuracy: 0.9748199784331864
Epoch 3, Validation Loss: 1.6870239430688403, Validation Accuracy: 0.974759925506015
Epoch 4, Validation Loss: 1.6644254639089193, Validation Accuracy: 0.9747780658840961
Epoch 5, Validation Loss: 1.6381107582582815, Validation Accuracy: 0.9748100729054375
Epoch 6, Validation Loss: 1.6144779053861549, Validation Accuracy: 0.9748757465434018
Epoch 7, Validation Loss: 1.5921557725478674, Validation Accuracy: 0.9747695231575264
Epoch 8, Validation Loss: 1.5631913969444362, Validation Accuracy: 0.9747801860750435
Epoch 9, Validation Loss: 1.5394697475190624, Validation Accuracy: 0.9747780849639468
Epoch 10, Validation Loss: 1.512465131346824, Validation Accuracy: 0.9747115217546837
Epoch 11, Validation Loss: 1.4849756456768994, Validation Accuracy:
0.9747318887600206
Epoch 12, Validation Loss: 1.4479955369906699, Validation Accuracy: 0.974776799969346
Epoch 13, Validation Loss: 1.4109298868606868, Validation Accuracy:
0.9748576450181504
Epoch 14, Validation Loss: 1.361650968821642, Validation Accuracy: 0.9747010119595216
Epoch 15, Validation Loss: 1.3822551423973117, Validation Accuracy:
0.9746837706848847
Epoch 16, Validation Loss: 1.3623866715840522, Validation Accuracy:
0.9747599654575092
Epoch 17, Validation Loss: 1.3716098167566668, Validation Accuracy:
0.9747574105395476

Early stopping due to no improvement.

Tuning GIN with lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 1.741821678054333, Validation Accuracy: 0.9744867196042963
Epoch 1, Validation Loss: 1.738860741650556, Validation Accuracy: 0.9745413951397209

Epoch 2, Validation Loss: 1.7287148048009118, Validation Accuracy: 0.9745754485633711

Epoch 3, Validation Loss: 1.7066655536581932, Validation Accuracy: 0.9746586751691295

Epoch 4, Validation Loss: 1.6754650311199695, Validation Accuracy: 0.9747424418961183

Epoch 5, Validation Loss: 1.6546858138218745, Validation Accuracy: 0.9748693107018239

Epoch 6, Validation Loss: 1.6446479260416675, Validation Accuracy: 0.9746446780901

Epoch 7, Validation Loss: 1.612310893126049, Validation Accuracy: 0.9747381754384172

Epoch 8, Validation Loss: 1.6163820627127727, Validation Accuracy: 0.9748479717218463

Epoch 9, Validation Loss: 1.6063842990013328, Validation Accuracy: 0.9746815400488288

Epoch 10, Validation Loss: 1.5784568040644016, Validation Accuracy: 0.974722114382624

Epoch 11, Validation Loss: 1.5660971596938973, Validation Accuracy: 0.9746680468759984

Epoch 12, Validation Loss: 1.5515637872423136, Validation Accuracy: 0.974831717755692

Epoch 13, Validation Loss: 1.5431971936543756, Validation Accuracy: 0.9747385736106216

Epoch 14, Validation Loss: 1.5034878521877133, Validation Accuracy: 0.9746535068225822

Epoch 15, Validation Loss: 1.4885173312037294, Validation Accuracy: 0.974716295844114

Epoch 16, Validation Loss: 1.5101309443708424, Validation Accuracy: 0.974678272776742

Epoch 17, Validation Loss: 1.488925269113783, Validation Accuracy: 0.9747281532308557

Epoch 18, Validation Loss: 1.490954754527581, Validation Accuracy: 0.9746881662772735

Early stopping due to no improvement.

Tuning GIN with lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 1.7780799860830703, Validation Accuracy: 0.9741903027857721

Epoch 1, Validation Loss: 1.7648547970846677, Validation Accuracy: 0.9741907283955666

Epoch 2, Validation Loss: 1.7647689344284612, Validation Accuracy: 0.9740865264244363

Epoch 3, Validation Loss: 1.7532318065081236, Validation Accuracy: 0.9740351648127047

Epoch 4, Validation Loss: 1.7398079635682961, Validation Accuracy: 0.9739709334852483

Epoch 5, Validation Loss: 1.7190917305718947, Validation Accuracy: 0.9739594112251494

Epoch 6, Validation Loss: 1.6997287152981073, Validation Accuracy: 0.9739274188809027

Epoch 7, Validation Loss: 1.6806727574186477, Validation Accuracy: 0.9738801871102403

Epoch 8, Validation Loss: 1.673720902257994, Validation Accuracy: 0.9737821496900296

Epoch 9, Validation Loss: 1.6577763853188503, Validation Accuracy: 0.9737941395142067

Epoch 10, Validation Loss: 1.6487867557288587, Validation Accuracy: 0.9736976519682706

Epoch 11, Validation Loss: 1.6264170357146839, Validation Accuracy: 0.973624981158876

Epoch 12, Validation Loss: 1.6211849273416346, Validation Accuracy: 0.973719895094091

Epoch 13, Validation Loss: 1.618538096484424, Validation Accuracy: 0.9740659026373312

Epoch 14, Validation Loss: 1.6113613190116327, Validation Accuracy: 0.9740917159385496

Epoch 15, Validation Loss: 1.5889263587860105, Validation Accuracy: 0.9741589991496142

Epoch 16, Validation Loss: 1.5690538377198644, Validation Accuracy: 0.9742330567664401

Epoch 17, Validation Loss: 1.5628570897388252, Validation Accuracy: 0.9744132103042008

Epoch 18, Validation Loss: 1.562335723200119, Validation Accuracy: 0.9746299995402135

Epoch 19, Validation Loss: 1.5832998569113366, Validation Accuracy: 0.9748059689294899

Tuning GIN with lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 1.8963554504013165, Validation Accuracy: 0.9747651068415905

Epoch 1, Validation Loss: 1.89935908689968, Validation Accuracy: 0.9746636330440156

Epoch 2, Validation Loss: 1.8885960916199227, Validation Accuracy: 0.9748432974207292

Epoch 3, Validation Loss: 1.885269869107857, Validation Accuracy: 0.9748210532767105

Epoch 4, Validation Loss: 1.8826659008240296, Validation Accuracy: 0.9748032461511346

Epoch 5, Validation Loss: 1.8856152539862687, Validation Accuracy: 0.9747510614057048

Epoch 6, Validation Loss: 1.8737423838996312, Validation Accuracy: 0.9747586414909144

Epoch 7, Validation Loss: 1.8659954780097336, Validation Accuracy: 0.9747777854425512

Epoch 8, Validation Loss: 1.8633865291322158, Validation Accuracy: 0.974758933635848

Epoch 9, Validation Loss: 1.8656597672249438, Validation Accuracy: 0.9747705367677479

Epoch 10, Validation Loss: 1.8600910453670088, Validation Accuracy: 0.9747895726076653

Epoch 11, Validation Loss: 1.852485389700917, Validation Accuracy: 0.9747563537125715

Epoch 12, Validation Loss: 1.8386580924870377, Validation Accuracy: 0.9748453545029243

Epoch 13, Validation Loss: 1.8293986496701131, Validation Accuracy: 0.9748076667654301

Epoch 14, Validation Loss: 1.8317543965689467, Validation Accuracy: 0.9747377993021604

Epoch 15, Validation Loss: 1.8306128904610195, Validation Accuracy: 0.9746393748738738

Epoch 16, Validation Loss: 1.8096608234231368, Validation Accuracy: 0.9747791837589591

Epoch 17, Validation Loss: 1.8044275818942541, Validation Accuracy: 0.9747235508135067

Epoch 18, Validation Loss: 1.7943407930935695, Validation Accuracy: 0.9747394769105027

Epoch 19, Validation Loss: 1.7843243923914127, Validation Accuracy: 0.9747661785063008

Tuning GIN with lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 1.8409750231161683, Validation Accuracy: 0.9745757299386619

Epoch 1, Validation Loss: 1.8415995852203664, Validation Accuracy: 0.9745233017024483

Epoch 2, Validation Loss: 1.8343926354625197, Validation Accuracy: 0.9745552078676799

Epoch 3, Validation Loss: 1.816697197064741, Validation Accuracy: 0.9746267322306661

Epoch 4, Validation Loss: 1.8117550806049532, Validation Accuracy: 0.9747316128273864

Epoch 5, Validation Loss: 1.800882168370781, Validation Accuracy: 0.9747329215394755

Epoch 6, Validation Loss: 1.7951466121331154, Validation Accuracy: 0.9746472325251101

Epoch 7, Validation Loss: 1.776051971850391, Validation Accuracy: 0.9747220782139455

Epoch 8, Validation Loss: 1.7557024050228842, Validation Accuracy: 0.9747605702884907

Epoch 9, Validation Loss: 1.7395168441156275, Validation Accuracy: 0.9748229197542851

Epoch 10, Validation Loss: 1.7283418405480064, Validation Accuracy: 0.9747290113096105

Epoch 11, Validation Loss: 1.7022950688225094, Validation Accuracy: 0.9747062729873315

Epoch 12, Validation Loss: 1.6785115320216455, Validation Accuracy: 0.9747849333203842

Epoch 13, Validation Loss: 1.6680073236176858, Validation Accuracy: 0.9747260606370207

Epoch 14, Validation Loss: 1.638056481958256, Validation Accuracy: 0.9747162510638189

Epoch 15, Validation Loss: 1.6009115831863834, Validation Accuracy: 0.974687941396582

Epoch 16, Validation Loss: 1.6874343559046534, Validation Accuracy: 0.9747916980727122

Epoch 17, Validation Loss: 1.6616883282640222, Validation Accuracy: 0.9746618773408
Epoch 18, Validation Loss: 1.621024942668187, Validation Accuracy: 0.9747921701675413
Early stopping due to no improvement.

Tuning GIN with lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 1.7547202791336043, Validation Accuracy: 0.9747195388966529
Epoch 1, Validation Loss: 1.7506146002828018, Validation Accuracy: 0.9747800631456335
Epoch 2, Validation Loss: 1.7227963137964275, Validation Accuracy: 0.9747763946283631
Epoch 3, Validation Loss: 1.6909474392474533, Validation Accuracy: 0.9747441319652965
Epoch 4, Validation Loss: 1.660932134904753, Validation Accuracy: 0.9747664124321204
Epoch 5, Validation Loss: 1.6358405104232516, Validation Accuracy: 0.9747523260150929
Epoch 6, Validation Loss: 1.625634239590932, Validation Accuracy: 0.9747426355044191
Epoch 7, Validation Loss: 1.5887877869883535, Validation Accuracy: 0.9747886280620195
Epoch 8, Validation Loss: 1.567704445710699, Validation Accuracy: 0.9748303926203222
Epoch 9, Validation Loss: 1.5575531505293982, Validation Accuracy: 0.9748430564281737
Epoch 10, Validation Loss: 1.5551013539714118, Validation Accuracy:
0.9747538629400506
Epoch 11, Validation Loss: 1.5322422274804264, Validation Accuracy:
0.9747973233653647
Epoch 12, Validation Loss: 1.519988790540148, Validation Accuracy: 0.9748124275375273
Epoch 13, Validation Loss: 1.5010244744002519, Validation Accuracy:
0.9747924709561538
Epoch 14, Validation Loss: 1.4881734394930066, Validation Accuracy:
0.9747849143744636
Epoch 15, Validation Loss: 1.4703002769593754, Validation Accuracy:
0.9747905600649973
Epoch 16, Validation Loss: 1.5173721446129962, Validation Accuracy:
0.9747811582838007
Epoch 17, Validation Loss: 1.5594697708057172, Validation Accuracy:
0.9748142094644636
Epoch 18, Validation Loss: 1.5767865810090642, Validation Accuracy:
0.9747218354389954
Early stopping due to no improvement.

Tuning GIN with lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 1.8538606682822338, Validation Accuracy: 0.9742191689863882
Epoch 1, Validation Loss: 1.7173658167050858, Validation Accuracy: 0.9741896252615657
Epoch 2, Validation Loss: 1.5709467234715075, Validation Accuracy: 0.9747291681035254
Epoch 3, Validation Loss: 1.553638755392944, Validation Accuracy: 0.9748227348890433
Epoch 4, Validation Loss: 1.5993795204005645, Validation Accuracy: 0.9748123768663295
Epoch 5, Validation Loss: 1.3354457906396062, Validation Accuracy: 0.9748489043972269
Epoch 6, Validation Loss: 1.4000835868693449, Validation Accuracy: 0.9747520933487961
Epoch 7, Validation Loss: 1.4648925163636153, Validation Accuracy: 0.9747664936232832
Epoch 8, Validation Loss: 0.9677447320822281, Validation Accuracy: 0.9748612988712245
Epoch 9, Validation Loss: 0.6637830997472883, Validation Accuracy: 0.9747623437009272
Epoch 10, Validation Loss: 0.6280999403474644, Validation Accuracy:
0.9747487648991228
Epoch 11, Validation Loss: 1.995302943711541, Validation Accuracy: 0.9747581296037106
Epoch 12, Validation Loss: 2.0649029349305716, Validation Accuracy:
0.9747387516288102
Epoch 13, Validation Loss: 2.016566899575703, Validation Accuracy: 0.9748337195961744
Early stopping due to no improvement.

Tuning GIN with lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.118284127151688, Validation Accuracy: 0.974785794209163
Epoch 1, Validation Loss: 2.1167518038915163, Validation Accuracy: 0.9748146936856602
Epoch 2, Validation Loss: 1.9532724967414585, Validation Accuracy: 0.9747669518580002
Epoch 3, Validation Loss: 0.48511384500054266, Validation Accuracy:
0.9748675659997904
Epoch 4, Validation Loss: 0.10438014975478573, Validation Accuracy:
0.9747585960251367
Epoch 5, Validation Loss: 0.10315550677478313, Validation Accuracy:
0.9747960544127338
Epoch 6, Validation Loss: 0.1031727785794596, Validation Accuracy: 0.9747320824125995
Epoch 7, Validation Loss: 0.10329270736307423, Validation Accuracy:
0.9747082507306505
Epoch 8, Validation Loss: 0.10293656696678687, Validation Accuracy: 0.974815144128814
Epoch 9, Validation Loss: 0.10315003879275866, Validation Accuracy:
0.9747753179270492

Epoch 10, Validation Loss: 0.10315685295881172, Validation Accuracy: 0.9747775693865974

Epoch 11, Validation Loss: 0.10352936664378969, Validation Accuracy: 0.9746753296525011

Early stopping due to no improvement.

Tuning GIN with lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 1.543205217622957, Validation Accuracy: 0.9615929940552679

Epoch 1, Validation Loss: 1.4104522966616202, Validation Accuracy: 0.9746515287769785

Epoch 2, Validation Loss: 1.5861571611517291, Validation Accuracy: 0.9747922989668598

Epoch 3, Validation Loss: 1.4258931451039616, Validation Accuracy: 0.9747515128911868

Epoch 4, Validation Loss: 1.3315761913340443, Validation Accuracy: 0.9747785395359292

Epoch 5, Validation Loss: 0.35409631607846054, Validation Accuracy: 0.9748161924371938

Epoch 6, Validation Loss: 0.2879486061799023, Validation Accuracy: 0.974773753055579

Epoch 7, Validation Loss: 0.24461550452277322, Validation Accuracy: 0.9748535979641686

Epoch 8, Validation Loss: 0.2151084465365256, Validation Accuracy: 0.9747402625602563

Epoch 9, Validation Loss: 0.19380211907787892, Validation Accuracy: 0.9747944883539142

Epoch 10, Validation Loss: 0.1781394693159288, Validation Accuracy: 0.9747406762213952

Epoch 11, Validation Loss: 0.1660168723713967, Validation Accuracy: 0.9747962039798962

Epoch 12, Validation Loss: 0.15665981180910438, Validation Accuracy: 0.9747676674836602

Epoch 13, Validation Loss: 0.14925913828848017, Validation Accuracy: 0.9747049205457053

Epoch 14, Validation Loss: 0.14325446694645633, Validation Accuracy: 0.9746871016118195

Epoch 15, Validation Loss: 0.13815953207223056, Validation Accuracy: 0.9747199836524093

Epoch 16, Validation Loss: 0.13398947252455184, Validation Accuracy: 0.9747151560959915

Epoch 17, Validation Loss: 0.13047785140000856, Validation Accuracy: 0.974705786204642

Epoch 18, Validation Loss: 0.1274166084067993, Validation Accuracy: 0.9747494754382423

Epoch 19, Validation Loss: 0.12480046895908067, Validation Accuracy: 0.9747777817533134

Tuning GIN with lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 1.5806140932767814, Validation Accuracy: 0.9748091583544811

Epoch 1, Validation Loss: 1.401901349229178, Validation Accuracy: 0.9747151106341663

Epoch 2, Validation Loss: 1.3607012898641155, Validation Accuracy: 0.9747819312652457

Epoch 3, Validation Loss: 0.2617047402462356, Validation Accuracy: 0.9749136362707221

Epoch 4, Validation Loss: 0.2614285843978375, Validation Accuracy: 0.9748578231744394

Epoch 5, Validation Loss: 0.14548315159588238, Validation Accuracy: 0.9747037793667007

Epoch 6, Validation Loss: 0.12717450129113186, Validation Accuracy: 0.9748133422595169

Epoch 7, Validation Loss: 0.1176074921308321, Validation Accuracy: 0.9747416175786898

Epoch 8, Validation Loss: 0.11186264240860051, Validation Accuracy: 0.9748470428280082

Epoch 9, Validation Loss: 0.10878833742909337, Validation Accuracy: 0.97477010319812

Epoch 10, Validation Loss: 0.10685048988158295, Validation Accuracy: 0.9747285593848197

Epoch 11, Validation Loss: 0.10547116493099085, Validation Accuracy: 0.9747610860907528

Epoch 12, Validation Loss: 0.10453957956626309, Validation Accuracy: 0.9748022604643558

Epoch 13, Validation Loss: 0.10413317205315044, Validation Accuracy: 0.974759111855886

Epoch 14, Validation Loss: 0.10385304617304955, Validation Accuracy: 0.9747190652290031

Epoch 15, Validation Loss: 0.10350956539935421, Validation Accuracy: 0.9747588046522085

Epoch 16, Validation Loss: 0.10300983541712128, Validation Accuracy: 0.974868518854358

Epoch 17, Validation Loss: 0.10323293238563958, Validation Accuracy: 0.9747691600362703

Epoch 18, Validation Loss: 0.1031452927128331, Validation Accuracy: 0.9747975372352655

Epoch 19, Validation Loss: 0.10295466799520085, Validation Accuracy: 0.9748182138714441

Tuning GIN with lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 1.5929677035072922, Validation Accuracy: 0.9747738125959747

Epoch 1, Validation Loss: 1.3183095384362358, Validation Accuracy: 0.974776864402017

Epoch 2, Validation Loss: 0.4393759772884047, Validation Accuracy: 0.9747711109294531

Epoch 3, Validation Loss: 1.6473602362962603, Validation Accuracy: 0.9747811332519025

Epoch 4, Validation Loss: 2.1271648260189346, Validation Accuracy: 0.9747899159663865

Epoch 5, Validation Loss: 2.1301868421120322, Validation Accuracy: 0.9747444300829166

Early stopping due to no improvement.

Tuning GIN with lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 1.8826925643074355, Validation Accuracy: 0.9747665987030706

Epoch 1, Validation Loss: 1.7868645058882926, Validation Accuracy: 0.9748061866993627

Epoch 2, Validation Loss: 1.7295612272709964, Validation Accuracy: 0.974756453285518

Epoch 3, Validation Loss: 1.6111279716934255, Validation Accuracy: 0.9748011016693663

Epoch 4, Validation Loss: 1.4587247492847482, Validation Accuracy: 0.9747442749261693

Epoch 5, Validation Loss: 1.1609633054754422, Validation Accuracy: 0.9748319404997855

Epoch 6, Validation Loss: 1.3962234957595523, Validation Accuracy: 0.9747989974783668

Epoch 7, Validation Loss: 0.8457381455528159, Validation Accuracy: 0.9747385045501358

Epoch 8, Validation Loss: 1.2310662348865598, Validation Accuracy: 0.9747864819582363

Epoch 9, Validation Loss: 0.27611546000239273, Validation Accuracy: 0.9748339294839039

Epoch 10, Validation Loss: 0.24200285804774566, Validation Accuracy: 0.9747521071847399

Epoch 11, Validation Loss: 0.2211631267301498, Validation Accuracy: 0.974711157999065

Epoch 12, Validation Loss: 0.2040797310416811, Validation Accuracy: 0.9747936735058895

Epoch 13, Validation Loss: 0.18719036311428836, Validation Accuracy: 0.9748116237534207

Epoch 14, Validation Loss: 0.1767809275842778, Validation Accuracy: 0.9748275976605916

Epoch 15, Validation Loss: 0.1551489263551111, Validation Accuracy: 0.974710799951981

Epoch 16, Validation Loss: 0.14815583011648495, Validation Accuracy: 0.9747201413914904

Epoch 17, Validation Loss: 0.1424765088422127, Validation Accuracy: 0.9746940193293966

Epoch 18, Validation Loss: 0.13734292301809226, Validation Accuracy: 0.974873010843903

Epoch 19, Validation Loss: 0.13352051996637515, Validation Accuracy: 0.9747386648346176

Tuning GIN with lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 1.8417027906409489, Validation Accuracy: 0.9746463544554101

Epoch 1, Validation Loss: 1.6569918136583965, Validation Accuracy: 0.9747332815565729

Epoch 2, Validation Loss: 1.5141023211036408, Validation Accuracy: 0.974836515290516

Epoch 3, Validation Loss: 1.5974858638530898, Validation Accuracy: 0.974721484055601

Epoch 4, Validation Loss: 1.3898265214654921, Validation Accuracy: 0.9747027916628334

Epoch 5, Validation Loss: 1.3334153002155258, Validation Accuracy: 0.9747937788901091

Epoch 6, Validation Loss: 1.2924323792648562, Validation Accuracy: 0.9747675589472554

Epoch 7, Validation Loss: 0.6439419025855679, Validation Accuracy: 0.9748427351562939

Epoch 8, Validation Loss: 0.2566309202064947, Validation Accuracy: 0.9747753779476853

Epoch 9, Validation Loss: 0.20378860128724546, Validation Accuracy: 0.974804409036788

Epoch 10, Validation Loss: 0.17151538262296256, Validation Accuracy: 0.9748131873746599

Epoch 11, Validation Loss: 0.1499030651436846, Validation Accuracy: 0.9748000919704672

Epoch 12, Validation Loss: 0.135475569730509, Validation Accuracy: 0.9747721420689092

Epoch 13, Validation Loss: 0.1255847273519258, Validation Accuracy: 0.9747655984614166

Epoch 14, Validation Loss: 0.11890536640994898, Validation Accuracy: 0.974719905135754

Epoch 15, Validation Loss: 0.11422476440520203, Validation Accuracy: 0.9747094538652602

Epoch 16, Validation Loss: 0.11099075776508666, Validation Accuracy: 0.9747174513679286

Epoch 17, Validation Loss: 0.10863215097274732, Validation Accuracy: 0.9747758334397751

Epoch 18, Validation Loss: 0.10710753289700738, Validation Accuracy: 0.9747685262089921

Epoch 19, Validation Loss: 0.10566140344324834, Validation Accuracy: 0.9748642172115861

Tuning GIN with lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 1.641054476174166, Validation Accuracy: 0.9749088651766623
Epoch 1, Validation Loss: 1.610539482089764, Validation Accuracy: 0.9748056718530079
Epoch 2, Validation Loss: 1.4230920760566979, Validation Accuracy: 0.9747934158818088
Epoch 3, Validation Loss: 1.5999192027558145, Validation Accuracy: 0.9747012669805801
Epoch 4, Validation Loss: 1.591440583407093, Validation Accuracy: 0.9748345588704795
Epoch 5, Validation Loss: 1.362795588216136, Validation Accuracy: 0.9748717398413866
Epoch 6, Validation Loss: 1.3359571259801246, Validation Accuracy: 0.9748000715398962
Epoch 7, Validation Loss: 1.2908793140189436, Validation Accuracy: 0.9747792063175853
Epoch 8, Validation Loss: 1.2818807365794567, Validation Accuracy: 0.9747742040949773
Epoch 9, Validation Loss: 1.246093378607103, Validation Accuracy: 0.974766355140187
Epoch 10, Validation Loss: 1.121006655023796, Validation Accuracy: 0.9746932789641235
Epoch 11, Validation Loss: 1.5523666850996818, Validation Accuracy: 0.9747972382495286
Epoch 12, Validation Loss: 0.4142397380718226, Validation Accuracy: 0.9747697983627834
Epoch 13, Validation Loss: 0.27135743644485993, Validation Accuracy: 0.9747918056119854
Epoch 14, Validation Loss: 0.23753862423133612, Validation Accuracy: 0.9747184696192442
Epoch 15, Validation Loss: 1.7112088481863428, Validation Accuracy: 0.9747881772644023
Epoch 16, Validation Loss: 0.19531507198479275, Validation Accuracy: 0.9747268440104945
Epoch 17, Validation Loss: 0.18038452008078176, Validation Accuracy: 0.9747744618245349
Epoch 18, Validation Loss: 0.16903316911781396, Validation Accuracy: 0.9746579979307438
Epoch 19, Validation Loss: 0.15972918079745385, Validation Accuracy: 0.974718218265538

Tuning GIN with lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 1.8277270983311515, Validation Accuracy: 0.974773508478258

Epoch 1, Validation Loss: 1.71118772147911, Validation Accuracy: 0.9748044689883473
Epoch 2, Validation Loss: 1.5333384014031803, Validation Accuracy: 0.9749420166951048
Epoch 3, Validation Loss: 1.4036110208584203, Validation Accuracy: 0.9748576013655958
Epoch 4, Validation Loss: 1.312792421492251, Validation Accuracy: 0.9747824020969106
Epoch 5, Validation Loss: 1.1803063856418015, Validation Accuracy: 0.974723708211346
Epoch 6, Validation Loss: 0.7090605671237923, Validation Accuracy: 0.9748389601499803
Epoch 7, Validation Loss: 0.38568391360656795, Validation Accuracy:
0.9747152043451935
Epoch 8, Validation Loss: 0.24606035982556734, Validation Accuracy:
0.9747825531643145
Epoch 9, Validation Loss: 0.20736043617388156, Validation Accuracy:
0.9748537907105682
Epoch 10, Validation Loss: 0.17796729257325677, Validation Accuracy:
0.9747284580093392
Epoch 11, Validation Loss: 0.1544783829940164, Validation Accuracy:
0.9748028639032692
Epoch 12, Validation Loss: 0.1392708627816761, Validation Accuracy:
0.9747551097537308
Epoch 13, Validation Loss: 0.12858718077169162, Validation Accuracy:
0.9747843346625351
Epoch 14, Validation Loss: 0.12122422236736596, Validation Accuracy:
0.9747421600829583
Epoch 15, Validation Loss: 0.1160342383196129, Validation Accuracy:
0.9747564035092201
Epoch 16, Validation Loss: 0.11243837885096411, Validation Accuracy:
0.9747471005031161
Epoch 17, Validation Loss: 0.10976362558400661, Validation Accuracy:
0.9747976223015242
Epoch 18, Validation Loss: 0.10813230732756277, Validation Accuracy:
0.9747001920405328
Epoch 19, Validation Loss: 0.10657766491877234, Validation Accuracy:
0.9748018264653605

Tuning GIN with lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 1.7975406717883409, Validation Accuracy: 0.9747269277229973
Epoch 1, Validation Loss: 1.0495327231392975, Validation Accuracy: 0.974790710269439
Epoch 2, Validation Loss: 1.0635612102532122, Validation Accuracy: 0.974710835002248

Epoch 3, Validation Loss: 1.0291558164519623, Validation Accuracy: 0.9748165784472012

Epoch 4, Validation Loss: 0.28410802208922487, Validation Accuracy: 0.9747680748294104

Epoch 5, Validation Loss: 0.25814118134851566, Validation Accuracy: 0.9746892355168167

Epoch 6, Validation Loss: 0.2557434618736504, Validation Accuracy: 0.9746720340022069

Epoch 7, Validation Loss: 0.23386504624279275, Validation Accuracy: 0.9747984823903629

Epoch 8, Validation Loss: 0.24226313202454716, Validation Accuracy: 0.9747742685278604

Epoch 9, Validation Loss: 0.25678035668640514, Validation Accuracy: 0.9748402290688586

Epoch 10, Validation Loss: 0.2506478182167258, Validation Accuracy: 0.9748492410330022

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 1.976299964094872, Validation Accuracy: 0.9746731692370545

Epoch 1, Validation Loss: 1.804635272004263, Validation Accuracy: 0.9748172030923463

Epoch 2, Validation Loss: 0.15255369806186142, Validation Accuracy: 0.9748016167025196

Epoch 3, Validation Loss: 0.1321512865313969, Validation Accuracy: 0.9748104008667389

Epoch 4, Validation Loss: 0.12358320481317214, Validation Accuracy: 0.9748908659458327

Epoch 5, Validation Loss: 0.11743447439694227, Validation Accuracy: 0.9748363558321709

Epoch 6, Validation Loss: 0.11966090368351924, Validation Accuracy: 0.974765913416706

Epoch 7, Validation Loss: 0.18398848295479864, Validation Accuracy: 0.9748232594859898

Epoch 8, Validation Loss: 0.1811653624517524, Validation Accuracy: 0.974856494425901

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.15025140372828277, Validation Accuracy: 0.9748168814014864

Epoch 1, Validation Loss: 0.11664623421415797, Validation Accuracy: 0.9747996822501999

Epoch 2, Validation Loss: 0.10844296297386621, Validation Accuracy: 0.9747731499458421

Epoch 3, Validation Loss: 0.10529249753091234, Validation Accuracy: 0.9748243993550876

Epoch 4, Validation Loss: 0.10402927043900892, Validation Accuracy: 0.9748043002840967

Epoch 5, Validation Loss: 0.10346629793660961, Validation Accuracy: 0.9747937379110869

Epoch 6, Validation Loss: 0.10341794422779131, Validation Accuracy: 0.9747167344937986

Epoch 7, Validation Loss: 0.10311805700915623, Validation Accuracy: 0.9747751246043445

Epoch 8, Validation Loss: 0.10309440764614725, Validation Accuracy: 0.9747633827643024

Epoch 9, Validation Loss: 0.10300103435870583, Validation Accuracy: 0.9747717787211435

Epoch 10, Validation Loss: 0.10296475655738976, Validation Accuracy: 0.9747781494096334

Epoch 11, Validation Loss: 0.10269071658144222, Validation Accuracy: 0.9748769014163683

Epoch 12, Validation Loss: 0.10338827812346277, Validation Accuracy: 0.9746730335384938

Epoch 13, Validation Loss: 0.10352674940087955, Validation Accuracy: 0.9746129872783937

Epoch 14, Validation Loss: 0.102834308917447, Validation Accuracy: 0.9748424298630858

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 1.6644961542273673, Validation Accuracy: 0.9748412734897358

Epoch 1, Validation Loss: 0.1513383183859418, Validation Accuracy: 0.9747291588985539

Epoch 2, Validation Loss: 0.11966443260572389, Validation Accuracy: 0.9747412685314578

Epoch 3, Validation Loss: 0.11056144053934526, Validation Accuracy: 0.9747725572405058

Epoch 4, Validation Loss: 0.10689358434480414, Validation Accuracy: 0.9748098737939946

Epoch 5, Validation Loss: 0.1053725898765009, Validation Accuracy: 0.9747388161710412

Epoch 6, Validation Loss: 0.10448067745300144, Validation Accuracy: 0.9747369174235029

Epoch 7, Validation Loss: 0.10368269661593969, Validation Accuracy: 0.9748315031604335

Epoch 8, Validation Loss: 0.10368708781343387, Validation Accuracy: 0.9747287899150217

Epoch 9, Validation Loss: 0.10336004408358344, Validation Accuracy: 0.9747804048012019

Epoch 10, Validation Loss: 0.10305789058505749, Validation Accuracy: 0.9748469455545221

Epoch 11, Validation Loss: 0.10311220679201057, Validation Accuracy: 0.9747994276662068

Epoch 12, Validation Loss: 0.10340829307754193, Validation Accuracy: 0.9746822190786013

Epoch 13, Validation Loss: 0.10309992329432414, Validation Accuracy: 0.9747829840050465

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.1066001123811118, Validation Accuracy: 0.9748383321963571

Epoch 1, Validation Loss: 2.120761323951314, Validation Accuracy: 0.9748177821151837

Epoch 2, Validation Loss: 0.1044235620277913, Validation Accuracy: 0.9747313545353488

Epoch 3, Validation Loss: 0.10291885916910899, Validation Accuracy: 0.9748061916466939

Epoch 4, Validation Loss: 0.10328562407946172, Validation Accuracy: 0.9747128374495214

Epoch 5, Validation Loss: 0.10309889987480847, Validation Accuracy: 0.9747892074198988

Epoch 6, Validation Loss: 0.10336408321341273, Validation Accuracy: 0.9746979025623994

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 1.030234917680266, Validation Accuracy: 0.9748145195904102

Epoch 1, Validation Loss: 0.25492734869794165, Validation Accuracy: 0.9747267148816807

Epoch 2, Validation Loss: 0.12096502689214852, Validation Accuracy: 0.9747448295244057

Epoch 3, Validation Loss: 0.11171566008615583, Validation Accuracy: 0.9748326906713071

Epoch 4, Validation Loss: 0.10824572994713452, Validation Accuracy: 0.9747141061409694

Epoch 5, Validation Loss: 0.1063346941550967, Validation Accuracy: 0.974768960327863

Epoch 6, Validation Loss: 0.1052276234352781, Validation Accuracy: 0.9748304742632593

Epoch 7, Validation Loss: 0.10459096692779815, Validation Accuracy: 0.9747760640948645

Epoch 8, Validation Loss: 0.10474187462005959, Validation Accuracy: 0.9746688885594672

Epoch 9, Validation Loss: 0.10405864535828604, Validation Accuracy: 0.9747771182391255

Epoch 10, Validation Loss: 0.10384022485621958, Validation Accuracy: 0.9747629717252286

Epoch 11, Validation Loss: 0.10361749615529482, Validation Accuracy: 0.9747888212560634

Epoch 12, Validation Loss: 0.10356948168361306, Validation Accuracy: 0.9747539919611395

Epoch 13, Validation Loss: 0.1028449113455326, Validation Accuracy: 0.9747874463664636

Epoch 14, Validation Loss: 0.1035054089968317, Validation Accuracy: 0.9747374766596252

Epoch 15, Validation Loss: 0.10332600140098307, Validation Accuracy: 0.9747498358637146

Epoch 16, Validation Loss: 0.10332445459204631, Validation Accuracy: 0.9747364009465544

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 1.593939911870009, Validation Accuracy: 0.9743823658683676

Epoch 1, Validation Loss: 0.2781445174096684, Validation Accuracy: 0.9747596430223021

Epoch 2, Validation Loss: 0.10278762454079192, Validation Accuracy: 0.9748595573790175

Epoch 3, Validation Loss: 0.10292676825159537, Validation Accuracy: 0.9748258253806795

Epoch 4, Validation Loss: 0.10313325397966074, Validation Accuracy: 0.9747961623344776

Epoch 5, Validation Loss: 0.10323179529392838, Validation Accuracy: 0.9747594342393984

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.1262859390036346, Validation Accuracy: 0.9747792900496597

Epoch 1, Validation Loss: 2.1289416507219263, Validation Accuracy: 0.9747631330285773

Epoch 2, Validation Loss: 2.1281207619470637, Validation Accuracy: 0.9747664697586003

Epoch 3, Validation Loss: 2.1239181030033243, Validation Accuracy: 0.9748311690965376

Epoch 4, Validation Loss: 2.1273602662104234, Validation Accuracy: 0.9747836481971535

Epoch 5, Validation Loss: 2.1269479496011665, Validation Accuracy: 0.9747697574309911

Epoch 6, Validation Loss: 2.131675862127143, Validation Accuracy: 0.9747280339002965

Early stopping due to no improvement.

Tuning GIN with lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 1.7373042668839775, Validation Accuracy: 0.9748306671878872

Epoch 1, Validation Loss: 0.12235762672521933, Validation Accuracy: 0.9748354557161253

Epoch 2, Validation Loss: 0.10379923461351738, Validation Accuracy: 0.9747555110578728

Epoch 3, Validation Loss: 2.129027792005326, Validation Accuracy: 0.9746986443786544

Epoch 4, Validation Loss: 2.131580898542854, Validation Accuracy: 0.9747426761678543

Epoch 5, Validation Loss: 2.128472006424485, Validation Accuracy: 0.974767823609816

Early stopping due to no improvement.

Best parameters for GIN: {'learning_rate': 0.001, 'hidden_channels': 64, 'dropout_rate': 0.3, 'heads': 1}

Best validation accuracy for GIN: 0.9748642172115861

Tuning GCN with lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 3.573581525093565, Validation Accuracy: 0.8448090783622144

Epoch 1, Validation Loss: 1.7962277094017483, Validation Accuracy: 0.8589689868210597

Epoch 2, Validation Loss: 1.8165620170237322, Validation Accuracy: 0.8755077432441408

Epoch 3, Validation Loss: 1.8074955998885385, Validation Accuracy: 0.8767736544756268
Epoch 4, Validation Loss: 1.9113248085455445, Validation Accuracy: 0.9035722952348111
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.0809155383516154, Validation Accuracy: 0.9623324160451336
Epoch 1, Validation Loss: 2.0746059018324274, Validation Accuracy: 0.9626840123245464
Epoch 2, Validation Loss: 2.0822816146324357, Validation Accuracy: 0.9628157442982097
Epoch 3, Validation Loss: 2.083230158328095, Validation Accuracy: 0.9627808360900719
Epoch 4, Validation Loss: 2.086686543668928, Validation Accuracy: 0.9626189709871719
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.0839613645011674, Validation Accuracy: 0.9747316402586883
Epoch 1, Validation Loss: 2.074732350948135, Validation Accuracy: 0.9748296556322861
Epoch 2, Validation Loss: 2.0849672248286586, Validation Accuracy: 0.974685322544392
Epoch 3, Validation Loss: 2.0786370626158512, Validation Accuracy: 0.9747810070736823
Epoch 4, Validation Loss: 2.0816018774033185, Validation Accuracy: 0.9747275909201232
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.112914027854172, Validation Accuracy: 0.974788692460363
Epoch 1, Validation Loss: 2.1111445155540114, Validation Accuracy: 0.9748090316782746
Epoch 2, Validation Loss: 2.1094565796423197, Validation Accuracy: 0.9748532724458678
Epoch 3, Validation Loss: 2.117312153981578, Validation Accuracy: 0.974751202171698
Epoch 4, Validation Loss: 2.109395688801782, Validation Accuracy: 0.9748286967159315
Epoch 5, Validation Loss: 2.1124632242077928, Validation Accuracy: 0.9748162675369381
Epoch 6, Validation Loss: 2.1198675085238134, Validation Accuracy: 0.9747400803840857
Epoch 7, Validation Loss: 2.1143824582360224, Validation Accuracy: 0.9747785587090874
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.0696964042802013, Validation Accuracy: 0.974763656804129
Epoch 1, Validation Loss: 2.0641202701824177, Validation Accuracy: 0.9748781977093249
Epoch 2, Validation Loss: 2.069862150524745, Validation Accuracy: 0.9748039498581493
Epoch 3, Validation Loss: 2.071033460478629, Validation Accuracy: 0.9748054589023948
Epoch 4, Validation Loss: 2.0754739511249674, Validation Accuracy: 0.974754597621858
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 2.1151230343370226, Validation Accuracy: 0.9747466747063062
Epoch 1, Validation Loss: 2.1059848123389497, Validation Accuracy: 0.9748465912864872
Epoch 2, Validation Loss: 2.111928666126048, Validation Accuracy: 0.9747771826897524
Epoch 3, Validation Loss: 2.1120290314737087, Validation Accuracy: 0.9747977097188759
Epoch 4, Validation Loss: 2.1115461865592535, Validation Accuracy: 0.9747877264506637
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.0991290264182885, Validation Accuracy: 0.9748605207226355
Epoch 1, Validation Loss: 2.1107768976215096, Validation Accuracy: 0.9747023277434119
Epoch 2, Validation Loss: 2.1046780862894012, Validation Accuracy: 0.9748146482788221
Epoch 3, Validation Loss: 2.107886600065468, Validation Accuracy: 0.9747635520083389
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.0971481700245262, Validation Accuracy: 0.9748148867346991
Epoch 1, Validation Loss: 2.0955665567450725, Validation Accuracy: 0.9748646163277818
Epoch 2, Validation Loss: 2.102959756371993, Validation Accuracy: 0.974794769825286
Epoch 3, Validation Loss: 2.109195042854503, Validation Accuracy: 0.9747161442630993
Epoch 4, Validation Loss: 2.100504836099911, Validation Accuracy: 0.9748212739546538
Early stopping due to no improvement.

Tuning GCN with lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.1015726194044495, Validation Accuracy: 0.9748387014347587

Epoch 1, Validation Loss: 2.1041937107705597, Validation Accuracy: 0.9748050972405704
Epoch 2, Validation Loss: 2.103691060105269, Validation Accuracy: 0.9748331237797336
Epoch 3, Validation Loss: 2.1085991418317294, Validation Accuracy: 0.9747756401249722
Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.0816040048583715, Validation Accuracy: 0.9735641054471487
Epoch 1, Validation Loss: 2.0871582545665923, Validation Accuracy: 0.9747713799917284
Epoch 2, Validation Loss: 2.096075607736412, Validation Accuracy: 0.9747197539913826
Epoch 3, Validation Loss: 2.0843991874613184, Validation Accuracy: 0.9747832153892156
Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.056288044603328, Validation Accuracy: 0.9740906304281189
Epoch 1, Validation Loss: 2.0212696217746933, Validation Accuracy: 0.9742917318447177
Epoch 2, Validation Loss: 2.008124796947799, Validation Accuracy: 0.974376658773523
Epoch 3, Validation Loss: 2.032491515942365, Validation Accuracy: 0.9740795693377905
Epoch 4, Validation Loss: 2.0103815871108592, Validation Accuracy: 0.9721030865159384
Epoch 5, Validation Loss: 1.9685782214072207, Validation Accuracy: 0.9709929864172494
Epoch 6, Validation Loss: 1.9984448914929112, Validation Accuracy: 0.9710164554374489
Epoch 7, Validation Loss: 2.0231158979913206, Validation Accuracy: 0.9703595711597529
Epoch 8, Validation Loss: 1.9260383842333844, Validation Accuracy: 0.9748516400104273
Epoch 9, Validation Loss: 1.9495568230110907, Validation Accuracy: 0.9748792517441415
Epoch 10, Validation Loss: 2.002709187132107, Validation Accuracy: 0.974749423219902
Epoch 11, Validation Loss: 1.951186662648278, Validation Accuracy: 0.9748255106941762
Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.0992881828322822, Validation Accuracy: 0.9738990914758152
Epoch 1, Validation Loss: 2.1043790240145794, Validation Accuracy: 0.9747143937381211
Epoch 2, Validation Loss: 2.0975343573551912, Validation Accuracy: 0.974848244178118
Epoch 3, Validation Loss: 2.103370895678589, Validation Accuracy: 0.974770255566737

Epoch 4, Validation Loss: 2.1086872942912076, Validation Accuracy: 0.9747171421199589
Epoch 5, Validation Loss: 2.0964896444499344, Validation Accuracy: 0.9748650381827612
Epoch 6, Validation Loss: 2.096528750569294, Validation Accuracy: 0.9747422364373959
Epoch 7, Validation Loss: 2.0921471370730744, Validation Accuracy: 0.9747933514749658
Epoch 8, Validation Loss: 2.094769260353841, Validation Accuracy: 0.9747680407103881
Epoch 9, Validation Loss: 2.095294211475784, Validation Accuracy: 0.9747377298457686
Epoch 10, Validation Loss: 2.094778849898142, Validation Accuracy: 0.974680730940295
Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.1182738728913715, Validation Accuracy: 0.9747916549571047
Epoch 1, Validation Loss: 2.115067588558268, Validation Accuracy: 0.9748227711040288
Epoch 2, Validation Loss: 2.123828854809328, Validation Accuracy: 0.9747324325014688
Epoch 3, Validation Loss: 2.119744824860291, Validation Accuracy: 0.9747897013030472
Epoch 4, Validation Loss: 2.120535242646267, Validation Accuracy: 0.9747695405118142
Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.1101496982071595, Validation Accuracy: 0.974767718416219
Epoch 1, Validation Loss: 2.1170780554081015, Validation Accuracy: 0.9746650183646051
Epoch 2, Validation Loss: 2.1068964723321995, Validation Accuracy: 0.9747852597820426
Epoch 3, Validation Loss: 2.110788185898187, Validation Accuracy: 0.9747574204193389
Epoch 4, Validation Loss: 2.1077204866903294, Validation Accuracy: 0.9747947249288499
Epoch 5, Validation Loss: 2.1046441815627124, Validation Accuracy: 0.9748482929121631
Epoch 6, Validation Loss: 2.1103618368321553, Validation Accuracy: 0.9747782138549907
Epoch 7, Validation Loss: 2.1182691705212107, Validation Accuracy: 0.974691113524564
Epoch 8, Validation Loss: 2.104337441344415, Validation Accuracy: 0.9748581091091142
Epoch 9, Validation Loss: 2.112156337381297, Validation Accuracy: 0.974764414222254
Epoch 10, Validation Loss: 2.103599323777464, Validation Accuracy: 0.97485080117724
Epoch 11, Validation Loss: 2.1074145809740346, Validation Accuracy:
0.9748194546982651
Epoch 12, Validation Loss: 2.1157688419369256, Validation Accuracy:
0.9746977732814208

Epoch 13, Validation Loss: 2.1013483013172007, Validation Accuracy: 0.9748680829761911

Epoch 14, Validation Loss: 2.1078877177714026, Validation Accuracy: 0.9747951982092938

Epoch 15, Validation Loss: 2.1060056394510975, Validation Accuracy: 0.9748175806999486

Epoch 16, Validation Loss: 2.1089051583658738, Validation Accuracy: 0.9747794382542088

Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 2.119454800121246, Validation Accuracy: 0.974524619644627

Epoch 1, Validation Loss: 2.124621431673727, Validation Accuracy: 0.9747275630788885

Epoch 2, Validation Loss: 2.1181215899014294, Validation Accuracy: 0.9748022806694868

Epoch 3, Validation Loss: 2.123544029946954, Validation Accuracy: 0.9746750376258774

Epoch 4, Validation Loss: 2.1251184020385554, Validation Accuracy: 0.9747140353834914

Epoch 5, Validation Loss: 2.1215875122890284, Validation Accuracy: 0.9747662596433863

Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.085278784962505, Validation Accuracy: 0.9745799950948332

Epoch 1, Validation Loss: 2.0772627772527654, Validation Accuracy: 0.9747212541773549

Epoch 2, Validation Loss: 2.0831604986717327, Validation Accuracy: 0.9746095197687407

Epoch 3, Validation Loss: 2.0800573588452917, Validation Accuracy: 0.9746393100911431

Epoch 4, Validation Loss: 2.076530595866977, Validation Accuracy: 0.9746876827863472

Epoch 5, Validation Loss: 2.0722907649967865, Validation Accuracy: 0.9746935396079454

Epoch 6, Validation Loss: 2.0849493519396107, Validation Accuracy: 0.974636070532571

Epoch 7, Validation Loss: 2.0780676313428668, Validation Accuracy: 0.9747021718525256

Epoch 8, Validation Loss: 2.0803537741118565, Validation Accuracy: 0.9746635643154693

Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.099330550609688, Validation Accuracy: 0.9748197579058705

Epoch 1, Validation Loss: 2.1040295864231235, Validation Accuracy: 0.9747382085234909

Epoch 2, Validation Loss: 2.103837140884352, Validation Accuracy: 0.9747503653812741

Epoch 3, Validation Loss: 2.10168626834234, Validation Accuracy: 0.9747927497541099

Early stopping due to no improvement.

Tuning GCN with lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.0704377385286183, Validation Accuracy: 0.9748027149691295

Epoch 1, Validation Loss: 2.070581946531241, Validation Accuracy: 0.9747326360324362

Epoch 2, Validation Loss: 2.0629779760432303, Validation Accuracy: 0.9747581790139219

Epoch 3, Validation Loss: 2.055550264143766, Validation Accuracy: 0.9747221789445992

Epoch 4, Validation Loss: 2.051034478484549, Validation Accuracy: 0.9746863581776836

Epoch 5, Validation Loss: 2.0418522204861747, Validation Accuracy: 0.9747839445425708

Epoch 6, Validation Loss: 2.035170702943139, Validation Accuracy: 0.9747087625377057

Epoch 7, Validation Loss: 2.028708964660209, Validation Accuracy: 0.9747682985397954

Epoch 8, Validation Loss: 2.0127029359784374, Validation Accuracy: 0.974761077324066

Epoch 9, Validation Loss: 2.0062802354470155, Validation Accuracy: 0.9747616906934213

Epoch 10, Validation Loss: 1.997944312395294, Validation Accuracy: 0.9747444039669118

Epoch 11, Validation Loss: 1.9744058278544525, Validation Accuracy:
0.973888250099013

Epoch 12, Validation Loss: 1.943659265970505, Validation Accuracy: 0.971670222687841

Epoch 13, Validation Loss: 1.9650748304042867, Validation Accuracy: 0.974450876502777

Epoch 14, Validation Loss: 1.9132488081946952, Validation Accuracy:
0.9715427523067056

Epoch 15, Validation Loss: 1.9909035068365835, Validation Accuracy:
0.9745904969224991

Epoch 16, Validation Loss: 1.9323990568236185, Validation Accuracy:
0.9735439869214264

Epoch 17, Validation Loss: 1.8288353396879389, Validation Accuracy:
0.9709859910352842

Epoch 18, Validation Loss: 1.9560985210330162, Validation Accuracy:
0.9740613985799663

Epoch 19, Validation Loss: 1.804509586342281, Validation Accuracy: 0.9687131050767415

Tuning GCN with lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.0399656128932753, Validation Accuracy: 0.9747684103255664

Epoch 1, Validation Loss: 2.0646379685431495, Validation Accuracy: 0.9748089399007075
Epoch 2, Validation Loss: 2.0036058739801854, Validation Accuracy: 0.9747703200067429
Epoch 3, Validation Loss: 1.6039951551384173, Validation Accuracy: 0.9632540096292435
Epoch 4, Validation Loss: 0.46711102677116323, Validation Accuracy:
0.9747614972988851
Epoch 5, Validation Loss: 0.19667670876712123, Validation Accuracy:
0.9748009695471275
Epoch 6, Validation Loss: 0.11562088663428652, Validation Accuracy: 0.974776170138809
Epoch 7, Validation Loss: 0.12204887086141938, Validation Accuracy:
0.9747445453174945
Epoch 8, Validation Loss: 0.11718688805405023, Validation Accuracy:
0.9747874029031294
Epoch 9, Validation Loss: 0.11529275963993434, Validation Accuracy: 0.974816669647648
Epoch 10, Validation Loss: 0.11139767025377852, Validation Accuracy:
0.9747728973370824
Epoch 11, Validation Loss: 0.11226801394898601, Validation Accuracy:
0.9746993891987032
Epoch 12, Validation Loss: 0.10314593841287102, Validation Accuracy:
0.974747706890564
Epoch 13, Validation Loss: 0.10327283968275446, Validation Accuracy:
0.9747216985710709
Epoch 14, Validation Loss: 0.10334706619825612, Validation Accuracy:
0.9747086086285571
Epoch 15, Validation Loss: 0.10322281116938621, Validation Accuracy:
0.9747180672140031
Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 1.526199654086144, Validation Accuracy: 0.9747401714817123
Epoch 1, Validation Loss: 1.050337867570981, Validation Accuracy: 0.9748745003016083
Epoch 2, Validation Loss: 1.5607501105255177, Validation Accuracy: 0.5568438069019059
Epoch 3, Validation Loss: 1.0762697478663725, Validation Accuracy: 0.9747450752002615
Epoch 4, Validation Loss: 0.7205006116831103, Validation Accuracy: 0.9748624692424246
Epoch 5, Validation Loss: 0.591298595160333, Validation Accuracy: 0.974729712127133
Epoch 6, Validation Loss: 0.34219909258471065, Validation Accuracy:
0.9747248059144057

Epoch 7, Validation Loss: 0.21460339841583081, Validation Accuracy: 0.9747232764477226

Epoch 8, Validation Loss: 4.618930833625651, Validation Accuracy: 0.9301363703715058

Epoch 9, Validation Loss: 0.2131699091204842, Validation Accuracy: 0.9747530214644013

Epoch 10, Validation Loss: 0.17758514420140914, Validation Accuracy: 0.974773619230612

Epoch 11, Validation Loss: 0.16405095079585577, Validation Accuracy: 0.9748317132675088

Epoch 12, Validation Loss: 0.16595679251292245, Validation Accuracy: 0.9748927022170188

Epoch 13, Validation Loss: 0.1440361270556231, Validation Accuracy: 0.9747774859747187

Epoch 14, Validation Loss: 0.13759736450291968, Validation Accuracy: 0.9748262646908533

Epoch 15, Validation Loss: 0.14202937729675183, Validation Accuracy: 0.9747501959873036

Epoch 16, Validation Loss: 0.1407276632925195, Validation Accuracy: 0.9746658254297078

Epoch 17, Validation Loss: 0.12096394223644036, Validation Accuracy: 0.9747158728131784

Epoch 18, Validation Loss: 0.10922115852607983, Validation Accuracy: 0.974772482230364

Epoch 19, Validation Loss: 0.10863892338411979, Validation Accuracy: 0.9747601679590523

Tuning GCN with lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.1343992600222084, Validation Accuracy: 0.9746765258983688

Epoch 1, Validation Loss: 2.127961800130958, Validation Accuracy: 0.9747670976031553

Epoch 2, Validation Loss: 2.129761115714871, Validation Accuracy: 0.9747576783091757

Epoch 3, Validation Loss: 2.130237278290481, Validation Accuracy: 0.974762778291595

Epoch 4, Validation Loss: 2.1283189751226317, Validation Accuracy: 0.9747703785081948

Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.1091712642987965, Validation Accuracy: 0.9748280302952871

Epoch 1, Validation Loss: 2.0969212057424835, Validation Accuracy: 0.9747397995019476

Epoch 2, Validation Loss: 2.1051199517164276, Validation Accuracy: 0.9748068748467261
Epoch 3, Validation Loss: 2.094635480160494, Validation Accuracy: 0.9747494744263392
Epoch 4, Validation Loss: 2.09118539035764, Validation Accuracy: 0.9747826597894425
Epoch 5, Validation Loss: 2.1052659557711695, Validation Accuracy: 0.9748238564078459
Epoch 6, Validation Loss: 2.095747580155545, Validation Accuracy: 0.974799617881901
Epoch 7, Validation Loss: 2.071668052825893, Validation Accuracy: 0.9747780658840961
Epoch 8, Validation Loss: 2.0170067861604632, Validation Accuracy: 0.9744659755034869
Epoch 9, Validation Loss: 2.0353874894753297, Validation Accuracy: 0.9679003513254552
Epoch 10, Validation Loss: 1.8825257085967235, Validation Accuracy:
0.9717913129717529
Epoch 11, Validation Loss: 1.974119990148804, Validation Accuracy: 0.9747672502969235
Epoch 12, Validation Loss: 1.9402332793736607, Validation Accuracy: 0.974791203739177
Epoch 13, Validation Loss: 1.8978025307567592, Validation Accuracy:
0.9747348681302678
Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.1212208551301552, Validation Accuracy: 0.9747896583177265
Epoch 1, Validation Loss: 2.119625604256211, Validation Accuracy: 0.9748132898783192
Epoch 2, Validation Loss: 2.122539992478882, Validation Accuracy: 0.9747766711030161
Epoch 3, Validation Loss: 2.119714011181673, Validation Accuracy: 0.9748684039137864
Epoch 4, Validation Loss: 2.131766625543682, Validation Accuracy: 0.9747107353579729
Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 2.1201916277852306, Validation Accuracy: 0.9747107944533824
Epoch 1, Validation Loss: 2.11006788040509, Validation Accuracy: 0.9747922126353108
Epoch 2, Validation Loss: 2.1174892003719625, Validation Accuracy: 0.9747957551821215
Epoch 3, Validation Loss: 2.11893172824649, Validation Accuracy: 0.9747813686755363
Epoch 4, Validation Loss: 2.1147069312058964, Validation Accuracy: 0.9748102527407937
Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.109597667681964, Validation Accuracy: 0.9747614241731287
Epoch 1, Validation Loss: 2.0919419780706354, Validation Accuracy: 0.9748467700298026
Epoch 2, Validation Loss: 2.077293799325787, Validation Accuracy: 0.9748048197697449
Epoch 3, Validation Loss: 2.083123672540963, Validation Accuracy: 0.9746908849376661
Epoch 4, Validation Loss: 2.0666031793832187, Validation Accuracy: 0.9744681068486991
Epoch 5, Validation Loss: 2.0293386377569957, Validation Accuracy: 0.9717788998112634
Epoch 6, Validation Loss: 2.059306765313868, Validation Accuracy: 0.9743603497291209
Epoch 7, Validation Loss: 2.041566632737011, Validation Accuracy: 0.9728065425716679
Epoch 8, Validation Loss: 1.9985155335404958, Validation Accuracy: 0.973801915300693
Epoch 9, Validation Loss: 1.8857588717113332, Validation Accuracy: 0.9738770024096631
Epoch 10, Validation Loss: 2.0219682435358557, Validation Accuracy:
0.9710519322560534
Epoch 11, Validation Loss: 1.9689544096009757, Validation Accuracy:
0.9727859707912119
Epoch 12, Validation Loss: 1.8734028369161082, Validation Accuracy:
0.9697813212659514
Epoch 13, Validation Loss: 1.9057408070473247, Validation Accuracy:
0.9747330879027952
Epoch 14, Validation Loss: 1.8378976729191365, Validation Accuracy:
0.9746058828938361
Epoch 15, Validation Loss: 1.81665794382007, Validation Accuracy: 0.9743107785425152
Epoch 16, Validation Loss: 1.7916057746000973, Validation Accuracy:
0.9727832036991123
Epoch 17, Validation Loss: 1.9575012940750407, Validation Accuracy:
0.9745194947830862
Epoch 18, Validation Loss: 1.9458796047702274, Validation Accuracy:
0.9743870184629144
Epoch 19, Validation Loss: 1.9287239810544738, Validation Accuracy:
0.9734664524089938
Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.1108820186211514, Validation Accuracy: 0.9748339634208644
Epoch 1, Validation Loss: 2.116607781231551, Validation Accuracy: 0.9747804945321559
Epoch 2, Validation Loss: 2.1216016570036818, Validation Accuracy: 0.974744727952385

Epoch 3, Validation Loss: 2.114707168219403, Validation Accuracy: 0.9747926421490115

Early stopping due to no improvement.

Tuning GCN with lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.1242309939624655, Validation Accuracy: 0.9747455392727942

Epoch 1, Validation Loss: 2.118432543265908, Validation Accuracy: 0.9748105552360872

Epoch 2, Validation Loss: 2.1192097106287555, Validation Accuracy: 0.9747804048012019

Epoch 3, Validation Loss: 2.1169934665816594, Validation Accuracy: 0.9747675894962459

Epoch 4, Validation Loss: 2.100338556075806, Validation Accuracy: 0.9746912413197549

Epoch 5, Validation Loss: 2.0804117443987513, Validation Accuracy: 0.9745043795452629

Epoch 6, Validation Loss: 2.0780286868807694, Validation Accuracy: 0.9741335492489356

Epoch 7, Validation Loss: 2.0540567072242424, Validation Accuracy: 0.9737379207463018

Epoch 8, Validation Loss: 2.05142922954583, Validation Accuracy: 0.973502339456102

Epoch 9, Validation Loss: 2.046302447691747, Validation Accuracy: 0.9729533768707205

Epoch 10, Validation Loss: 2.026229608207174, Validation Accuracy: 0.972833795474003

Epoch 11, Validation Loss: 2.019426258788135, Validation Accuracy: 0.9664128963032982

Epoch 12, Validation Loss: 2.0091786342938533, Validation Accuracy: 0.970087566032145

Epoch 13, Validation Loss: 1.9699195082040786, Validation Accuracy:
0.9723583050241373

Epoch 14, Validation Loss: 1.9601294221611945, Validation Accuracy:
0.9649417697202546

Epoch 15, Validation Loss: 2.004374722628121, Validation Accuracy: 0.9727325691331967

Epoch 16, Validation Loss: 1.9928575082797138, Validation Accuracy: 0.974584735004355

Epoch 17, Validation Loss: 1.9430856936599752, Validation Accuracy:
0.9736393037240646

Epoch 18, Validation Loss: 1.9381722588736505, Validation Accuracy:
0.9735820331259132

Epoch 19, Validation Loss: 1.8812692817168397, Validation Accuracy:
0.9710144557323531

Best parameters for GCN: {'learning_rate': 0.001, 'hidden_channels': 16, 'dropout_rate': 0.5,
'heads': 1}

Best validation accuracy for GCN: 0.9748255106941762

Tuning GAT with lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 3.0608964897461104, Validation Accuracy: 0.9360517531560384
Epoch 1, Validation Loss: 2.0726247025646787, Validation Accuracy: 0.9584172330965401
Epoch 2, Validation Loss: 2.006948242477019, Validation Accuracy: 0.9643444758975197
Epoch 3, Validation Loss: 2.005636733491425, Validation Accuracy: 0.9646528873703403
Epoch 4, Validation Loss: 2.004626825025476, Validation Accuracy: 0.9643986068131234
Epoch 5, Validation Loss: 2.011106058885863, Validation Accuracy: 0.9644788769834778
Epoch 6, Validation Loss: 2.0255614192486178, Validation Accuracy: 0.9645171921344612
Epoch 7, Validation Loss: 2.0182100206927833, Validation Accuracy: 0.9646049356848275
Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 1.6903222060449505, Validation Accuracy: 0.9315238910247404
Epoch 1, Validation Loss: 1.7959541743274583, Validation Accuracy: 0.9504583218369662
Epoch 2, Validation Loss: 1.8873007228036431, Validation Accuracy: 0.9571186206826068
Epoch 3, Validation Loss: 2.0100363442921694, Validation Accuracy: 0.9664079386410902
Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.5045030998532885, Validation Accuracy: 0.9636847400325821
Epoch 1, Validation Loss: 2.153024410380619, Validation Accuracy: 0.9672338066171153
Epoch 2, Validation Loss: 2.1110751097906317, Validation Accuracy: 0.9692041946891801
Epoch 3, Validation Loss: 2.1215315492218245, Validation Accuracy: 0.9740340030911901
Epoch 4, Validation Loss: 2.1182404508809594, Validation Accuracy: 0.973790956423056
Epoch 5, Validation Loss: 2.118418303302145, Validation Accuracy: 0.9730968177218037
Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.211143617964264, Validation Accuracy: 0.9734863292478212
Epoch 1, Validation Loss: 2.1171981685658543, Validation Accuracy: 0.9746605525680492
Epoch 2, Validation Loss: 2.106562194213382, Validation Accuracy: 0.97487399959639
Epoch 3, Validation Loss: 2.115496356788995, Validation Accuracy: 0.9747929659544013
Epoch 4, Validation Loss: 2.1125574365590998, Validation Accuracy: 0.9748126795261022

Epoch 5, Validation Loss: 2.1209988875809143, Validation Accuracy: 0.9747251765126463

Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.1072742477540047, Validation Accuracy: 0.9748446316133781

Epoch 1, Validation Loss: 2.121209043427082, Validation Accuracy: 0.9746875526704223

Epoch 2, Validation Loss: 2.1137280116601853, Validation Accuracy: 0.9747964218277705

Epoch 3, Validation Loss: 2.1145172131342567, Validation Accuracy: 0.9747990180174887

Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 3.0964168553464764, Validation Accuracy: 0.9649711221859777

Epoch 1, Validation Loss: 2.1048557504678778, Validation Accuracy: 0.9747834549629747

Epoch 2, Validation Loss: 2.10637026788579, Validation Accuracy: 0.9747476166993297

Epoch 3, Validation Loss: 2.107511851095384, Validation Accuracy: 0.9747306802335381

Epoch 4, Validation Loss: 2.104139935142053, Validation Accuracy: 0.9747961187861884

Epoch 5, Validation Loss: 2.1058734451275014, Validation Accuracy: 0.974759925506015

Epoch 6, Validation Loss: 2.1067551407713454, Validation Accuracy: 0.9747694822609895

Epoch 7, Validation Loss: 2.1001544287867344, Validation Accuracy: 0.9748635750490516

Epoch 8, Validation Loss: 2.10715262381078, Validation Accuracy: 0.9747396931253434

Epoch 9, Validation Loss: 2.10714377244708, Validation Accuracy: 0.9747364761933973

Epoch 10, Validation Loss: 2.1153596491730835, Validation Accuracy:
0.9746492978292359

Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.0491725402345726, Validation Accuracy: 0.9747328123322889

Epoch 1, Validation Loss: 2.059325156229601, Validation Accuracy: 0.9747638340375311

Epoch 2, Validation Loss: 2.0578471773463503, Validation Accuracy: 0.9747915905543193

Epoch 3, Validation Loss: 2.060107998901206, Validation Accuracy: 0.9747871902989935

Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.0144300089580627, Validation Accuracy: 0.9746979980637135
Epoch 1, Validation Loss: 2.024179461206455, Validation Accuracy: 0.9748803552675621
Epoch 2, Validation Loss: 2.039124798870856, Validation Accuracy: 0.9747160730980857
Epoch 3, Validation Loss: 2.0358373661047175, Validation Accuracy: 0.974793435923632
Early stopping due to no improvement.

Tuning GAT with lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.1041504558055633, Validation Accuracy: 0.974795584627964
Epoch 1, Validation Loss: 2.109815522917447, Validation Accuracy: 0.974735653213813
Epoch 2, Validation Loss: 2.0980689726011925, Validation Accuracy: 0.9747930938443023
Epoch 3, Validation Loss: 2.097921658908167, Validation Accuracy: 0.9747830061720987
Epoch 4, Validation Loss: 2.0976691632057833, Validation Accuracy: 0.9748055630052488
Epoch 5, Validation Loss: 2.111398132578019, Validation Accuracy: 0.9746405970164507
Epoch 6, Validation Loss: 2.102343538263004, Validation Accuracy: 0.9747559623842386
Epoch 7, Validation Loss: 2.1105500454494437, Validation Accuracy: 0.9746731316516879
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.1182519832704556, Validation Accuracy: 0.9747582091382385
Epoch 1, Validation Loss: 2.1212580799316947, Validation Accuracy: 0.9747393857652645
Epoch 2, Validation Loss: 2.1149244806532823, Validation Accuracy: 0.9747684682498116
Epoch 3, Validation Loss: 2.1132792747641913, Validation Accuracy: 0.9748161548642944
Epoch 4, Validation Loss: 2.120762661358263, Validation Accuracy: 0.9747373047673563
Epoch 5, Validation Loss: 2.1088677403648792, Validation Accuracy: 0.9747702905734814
Epoch 6, Validation Loss: 2.107363812902725, Validation Accuracy: 0.9748025621568311
Epoch 7, Validation Loss: 2.115319858524699, Validation Accuracy: 0.974717193125814
Epoch 8, Validation Loss: 2.111619331626679, Validation Accuracy: 0.9747872748179379
Epoch 9, Validation Loss: 2.1146407659089297, Validation Accuracy: 0.9747898301014896
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.109449884066215, Validation Accuracy: 0.9747811556209661

Epoch 1, Validation Loss: 2.110871504428369, Validation Accuracy: 0.9672398018901196
Epoch 2, Validation Loss: 2.115537283447555, Validation Accuracy: 0.9670722483979436
Epoch 3, Validation Loss: 2.120497378060784, Validation Accuracy: 0.9678319856565646
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 1.7017468744847903, Validation Accuracy: 0.881384721878105
Epoch 1, Validation Loss: 1.8098639473359495, Validation Accuracy: 0.9747413097439145
Epoch 2, Validation Loss: 1.787079439137972, Validation Accuracy: 0.9747707886810866
Epoch 3, Validation Loss: 1.6118412388362562, Validation Accuracy: 0.9748647674920726
Epoch 4, Validation Loss: 1.8108436761634243, Validation Accuracy: 0.9747375948106342
Epoch 5, Validation Loss: 1.8108548302246754, Validation Accuracy: 0.9747697165073542
Epoch 6, Validation Loss: 2.01096718778219, Validation Accuracy: 0.9747112521007975
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.1043535784515495, Validation Accuracy: 0.9747140415377501
Epoch 1, Validation Loss: 2.111020449890984, Validation Accuracy: 0.9746685739099339
Epoch 2, Validation Loss: 2.1137548336394074, Validation Accuracy: 0.9747051790385873
Epoch 3, Validation Loss: 2.114178746347096, Validation Accuracy: 0.9747175227820686
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.086623461903177, Validation Accuracy: 0.9747521970161455
Epoch 1, Validation Loss: 2.083324017506971, Validation Accuracy: 0.9746953789562418
Epoch 2, Validation Loss: 2.0882589862896848, Validation Accuracy: 0.9747814554644438
Epoch 3, Validation Loss: 2.0925123881983105, Validation Accuracy: 0.9747660901616104
Epoch 4, Validation Loss: 2.101532404535166, Validation Accuracy: 0.9746868422665876
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 2.10654403620559, Validation Accuracy: 0.9748280830106164

Epoch 1, Validation Loss: 2.1259250608330627, Validation Accuracy: 0.9747239019305789
Epoch 2, Validation Loss: 2.120646577023395, Validation Accuracy: 0.9748038296339261
Epoch 3, Validation Loss: 2.1299670468414984, Validation Accuracy: 0.9746920836101599
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.0875443335872133, Validation Accuracy: 0.9748569677155701
Epoch 1, Validation Loss: 2.1021994140100833, Validation Accuracy: 0.9747609815656314
Epoch 2, Validation Loss: 2.1019511789305336, Validation Accuracy: 0.9747983510505157
Epoch 3, Validation Loss: 2.1036397961913504, Validation Accuracy: 0.9747941874394951
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.036152132983243, Validation Accuracy: 0.974784787110976
Epoch 1, Validation Loss: 2.037471576157042, Validation Accuracy: 0.9748450005492358
Epoch 2, Validation Loss: 2.056244716011265, Validation Accuracy: 0.9746967053347673
Epoch 3, Validation Loss: 2.0524467185472437, Validation Accuracy: 0.9747975142333892
Early stopping due to no improvement.

Tuning GAT with lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.121510193084665, Validation Accuracy: 0.9747497713582088
Epoch 1, Validation Loss: 2.1224898151665115, Validation Accuracy: 0.9747690138974723
Epoch 2, Validation Loss: 2.116164792929926, Validation Accuracy: 0.9748253069897636
Epoch 3, Validation Loss: 2.118671649886716, Validation Accuracy: 0.9748214764757732
Epoch 4, Validation Loss: 2.1258257698850063, Validation Accuracy: 0.9747058943774978
Epoch 5, Validation Loss: 2.1197287792307566, Validation Accuracy: 0.9747891860961173
Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.0934753985232013, Validation Accuracy: 0.9747591517235565
Epoch 1, Validation Loss: 2.004220802996084, Validation Accuracy: 0.9747369604144263
Epoch 2, Validation Loss: 2.0214533231304332, Validation Accuracy: 0.9747327105096387

Epoch 3, Validation Loss: 2.073626728619798, Validation Accuracy: 0.97480831581072
Epoch 4, Validation Loss: 1.347395723093435, Validation Accuracy: 0.9747524942195425
Epoch 5, Validation Loss: 1.2358480559756735, Validation Accuracy: 0.974777444281244
Epoch 6, Validation Loss: 1.0485189395145542, Validation Accuracy: 0.9748248496338578
Epoch 7, Validation Loss: 0.998844284261519, Validation Accuracy: 0.97469897375092
Epoch 8, Validation Loss: 1.0777237599821896, Validation Accuracy: 0.9747540028814615
Epoch 9, Validation Loss: 0.9624493139433136, Validation Accuracy: 0.9747618840849938
Epoch 10, Validation Loss: 0.7535072284018062, Validation Accuracy: 0.974785109067044
Epoch 11, Validation Loss: 0.6763184622725098, Validation Accuracy:
0.9748931528406144
Epoch 12, Validation Loss: 0.6317955797293198, Validation Accuracy:
0.9747474618479024
Epoch 13, Validation Loss: 0.5491737500017985, Validation Accuracy:
0.9746940882180847
Epoch 14, Validation Loss: 0.5317132908980323, Validation Accuracy:
0.9747741531541891
Epoch 15, Validation Loss: 0.46860455029248893, Validation Accuracy:
0.9747593052869816
Epoch 16, Validation Loss: 0.4011805319590101, Validation Accuracy:
0.9747422746260267
Epoch 17, Validation Loss: 0.3685271053369303, Validation Accuracy:
0.9747756357837927
Epoch 18, Validation Loss: 0.2321505130224725, Validation Accuracy:
0.9747668804128452
Epoch 19, Validation Loss: 0.1035886468046874, Validation Accuracy:
0.9748175518214154

Tuning GAT with lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.1205355083528286, Validation Accuracy: 0.9748095191860554
Epoch 1, Validation Loss: 2.123847105736768, Validation Accuracy: 0.9747647441872342
Epoch 2, Validation Loss: 2.1263746251687223, Validation Accuracy: 0.9747551886720167
Epoch 3, Validation Loss: 2.119270867434684, Validation Accuracy: 0.9748312161378574
Epoch 4, Validation Loss: 2.1266589659836983, Validation Accuracy: 0.9747448047951415
Epoch 5, Validation Loss: 2.1316417307031363, Validation Accuracy: 0.9746940548274188
Epoch 6, Validation Loss: 2.1221616975131163, Validation Accuracy: 0.9747822088240554

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.1275657904946774, Validation Accuracy: 0.9746987767115308

Epoch 1, Validation Loss: 2.1191076887008866, Validation Accuracy: 0.9748358918035299

Epoch 2, Validation Loss: 2.1192413891663326, Validation Accuracy: 0.9748036766246174

Epoch 3, Validation Loss: 2.120822766652474, Validation Accuracy: 0.9748093845387553

Epoch 4, Validation Loss: 2.1197616465334264, Validation Accuracy: 0.9747973233653647

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 2.132389649674851, Validation Accuracy: 0.9747141999514619

Epoch 1, Validation Loss: 2.1218795604060956, Validation Accuracy: 0.9748482774122359

Epoch 2, Validation Loss: 2.1251757927701136, Validation Accuracy: 0.9748101434017805

Epoch 3, Validation Loss: 2.12918395916966, Validation Accuracy: 0.9747565177634117

Epoch 4, Validation Loss: 2.1246705186130392, Validation Accuracy: 0.9748153294440982

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 2.1211080057893144, Validation Accuracy: 0.9747301639193531

Epoch 1, Validation Loss: 2.1219595310557864, Validation Accuracy: 0.9747624399713907

Epoch 2, Validation Loss: 2.1278303961452125, Validation Accuracy: 0.9747700622447442

Epoch 3, Validation Loss: 2.124487997654354, Validation Accuracy: 0.9747971923658507

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 2.1257082557411997, Validation Accuracy: 0.9747913760239566

Epoch 1, Validation Loss: 2.1303865901441785, Validation Accuracy: 0.9747475134578585

Epoch 2, Validation Loss: 2.1349379280142986, Validation Accuracy: 0.9746758172572237

Epoch 3, Validation Loss: 2.1301785904923385, Validation Accuracy: 0.9747434744394252

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.118269423767, Validation Accuracy: 0.9748095835494495

Epoch 1, Validation Loss: 2.1260145252602864, Validation Accuracy: 0.9747410252742986

Epoch 2, Validation Loss: 2.1210553508538466, Validation Accuracy: 0.9748185442649765

Epoch 3, Validation Loss: 2.12536228176382, Validation Accuracy: 0.9747435389705789

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 2.1322170589904927, Validation Accuracy: 0.9747049550182558

Epoch 1, Validation Loss: 2.129497795631513, Validation Accuracy: 0.9747161376843988

Epoch 2, Validation Loss: 2.12064517960507, Validation Accuracy: 0.9748493695101923

Epoch 3, Validation Loss: 2.125843176105182, Validation Accuracy: 0.9747652042390982

Epoch 4, Validation Loss: 2.1251591512790093, Validation Accuracy: 0.9747641401010354

Epoch 5, Validation Loss: 2.130789520611834, Validation Accuracy: 0.9747102535871844

Early stopping due to no improvement.

Tuning GAT with lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.1129465824912854, Validation Accuracy: 0.9747913329398871

Epoch 1, Validation Loss: 2.116819516859634, Validation Accuracy: 0.9747803628132975

Epoch 2, Validation Loss: 2.118229477192569, Validation Accuracy: 0.9747607392683961

Epoch 3, Validation Loss: 2.1203017195608127, Validation Accuracy: 0.9747301551607825

Early stopping due to no improvement.

Best parameters for GAT: {'learning_rate': 0.01, 'hidden_channels': 16, 'dropout_rate': 0.3, 'heads': 8}

Best validation accuracy for GAT: 0.9748175518214154

Evaluating GIN model with the best hyperparameters...

Test Loss: 0.23379696151310989, Test Accuracy: 0.9753608665386645

Precision: 0.0000, F1 Score: 0.0000, Recall: 0.0000

Evaluating GCN model with the best hyperparameters...

Test Loss: 2.066562446375047, Test Accuracy: 0.9754703992657182

Precision: 0.0000, F1 Score: 0.0000, Recall: 0.0000

Evaluating GAT model with the best hyperparameters...

Test Loss: 1.9184506607528489, Test Accuracy: 0.8969665271966527

Precision: 0.0304, F1 Score: 0.0469, Recall: 0.1027

SMOTE BCELoss

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 66.21786625272878, Validation Accuracy: 0.025309537430532852

Epoch 1, Validation Loss: 12.598151302515129, Validation Accuracy: 0.025213713438709925

Epoch 2, Validation Loss: 10.227170972611118, Validation Accuracy: 0.03878296871805357

Epoch 3, Validation Loss: 5.297480532608316, Validation Accuracy: 0.9103371108000122

Epoch 4, Validation Loss: 2.226015207045723, Validation Accuracy: 0.9523403124504929

Epoch 5, Validation Loss: 0.6373486455261855, Validation Accuracy: 0.9748223588899763

Epoch 6, Validation Loss: 0.6176545050540574, Validation Accuracy: 0.9746904295553268

Epoch 7, Validation Loss: 0.6015880319379991, Validation Accuracy: 0.9747787101965744

Epoch 8, Validation Loss: 0.5789770086113336, Validation Accuracy: 0.9747625689048283

Epoch 9, Validation Loss: 0.5651549336040582, Validation Accuracy: 0.9747709528616517

Epoch 10, Validation Loss: 0.5528884416182639, Validation Accuracy: 0.9748285916533144

Epoch 11, Validation Loss: 0.5416710879607473, Validation Accuracy: 0.9748703405636033

Epoch 12, Validation Loss: 0.5316257907202463, Validation Accuracy: 0.9747462103988597

Epoch 13, Validation Loss: 0.5221769722460518, Validation Accuracy: 0.9747959483452336

Epoch 14, Validation Loss: 0.5143813045681558, Validation Accuracy: 0.9747241602182705

Epoch 15, Validation Loss: 0.5073225518905791, Validation Accuracy: 0.9747901091406926

Epoch 16, Validation Loss: 0.5010657595197853, Validation Accuracy: 0.9748052014408707

Epoch 17, Validation Loss: 0.4955387771425413, Validation Accuracy: 0.9746971859940702

Epoch 18, Validation Loss: 0.49056897292066154, Validation Accuracy: 0.9747690783307753

Epoch 19, Validation Loss: 0.4860070758954467, Validation Accuracy: 0.9748730238214465

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 77.88060346134839, Validation Accuracy: 0.025236206293215088

Epoch 1, Validation Loss: 83.13992360685363, Validation Accuracy: 0.025252757470330692

Epoch 2, Validation Loss: 88.27673199750649, Validation Accuracy: 0.025255725073830716

Epoch 3, Validation Loss: 86.84465535166245, Validation Accuracy: 0.025254267166386915

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 59.57120472858325, Validation Accuracy: 0.025259297285838703

Epoch 1, Validation Loss: 59.47742546994988, Validation Accuracy: 0.02516397964813339

Epoch 2, Validation Loss: 65.56756644568432, Validation Accuracy: 0.025247699296375593

Epoch 3, Validation Loss: 66.02198203680828, Validation Accuracy: 0.02519845121216146

Epoch 4, Validation Loss: 62.089099246278295, Validation Accuracy: 0.025258291508626744

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 87.80641904125734, Validation Accuracy: 0.025210513407455854

Epoch 1, Validation Loss: 82.11789095667989, Validation Accuracy: 0.02525577734850111

Epoch 2, Validation Loss: 77.3613943556698, Validation Accuracy: 0.025155080432412002
Epoch 3, Validation Loss: 67.79918184233067, Validation Accuracy: 0.02512958199110489
Epoch 4, Validation Loss: 62.091220427387704, Validation Accuracy:
0.02523250553949719
Epoch 5, Validation Loss: 60.215537973432326, Validation Accuracy:
0.025191432409928435
Epoch 6, Validation Loss: 60.99964222304578, Validation Accuracy: 0.02523993009065729
Epoch 7, Validation Loss: 59.84947444309964, Validation Accuracy:
0.025346422387594682
Epoch 8, Validation Loss: 60.26662700170323, Validation Accuracy: 0.02520218456398126
Epoch 9, Validation Loss: 40.33254903244322, Validation Accuracy: 0.02729934990596124
Epoch 10, Validation Loss: 24.81786013403838, Validation Accuracy:
0.02521235895942833
Epoch 11, Validation Loss: 23.07415066537431, Validation Accuracy:
0.02538968220117128
Epoch 12, Validation Loss: 17.18148597949196, Validation Accuracy: 0.6888014713395321
Epoch 13, Validation Loss: 14.862185506903504, Validation Accuracy:
0.7603296282100421
Epoch 14, Validation Loss: 12.4563149976967, Validation Accuracy: 0.7970162448324671
Epoch 15, Validation Loss: 12.625318144154608, Validation Accuracy:
0.7982035744576491
Epoch 16, Validation Loss: 4.3933106428636215, Validation Accuracy:
0.9116882917819452
Epoch 17, Validation Loss: 3.4537588530971157, Validation Accuracy:
0.9220612656804885
Epoch 18, Validation Loss: 3.1802227176152744, Validation Accuracy: 0.929813847116994
Epoch 19, Validation Loss: 2.5813126660162404, Validation Accuracy:
0.9323661991986262

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 91.42393461468794, Validation Accuracy: 0.025690745353516
Epoch 1, Validation Loss: 77.04579721076908, Validation Accuracy:
0.043501690725019665
Epoch 2, Validation Loss: 0.578836425954, Validation Accuracy: 0.9748842175713406
Epoch 3, Validation Loss: 0.5660453702025023, Validation Accuracy: 0.9748621762611064
Epoch 4, Validation Loss: 0.5545539598606952, Validation Accuracy: 0.9747535655702102

Epoch 5, Validation Loss: 0.5441500994171161, Validation Accuracy: 0.9748995881324926
Epoch 6, Validation Loss: 0.534802951232967, Validation Accuracy: 0.9747920838612122
Epoch 7, Validation Loss: 0.5263338572629924, Validation Accuracy: 0.9747956681651001
Epoch 8, Validation Loss: 0.5187063912304104, Validation Accuracy: 0.9747234418621283
Epoch 9, Validation Loss: 0.511785706722411, Validation Accuracy: 0.9747416439769715
Epoch 10, Validation Loss: 0.5055173165153333, Validation Accuracy: 0.974718124853057
Epoch 11, Validation Loss: 0.4998034227722632, Validation Accuracy:
0.9747677658783775
Epoch 12, Validation Loss: 0.49463503310461493, Validation Accuracy:
0.9747287162300241
Epoch 13, Validation Loss: 0.4899055891977646, Validation Accuracy:
0.9747778916249109
Epoch 14, Validation Loss: 0.4856298980730639, Validation Accuracy: 0.974716266856035
Epoch 15, Validation Loss: 0.48170329286501956, Validation Accuracy:
0.9747355031187899
Epoch 16, Validation Loss: 0.4781147931556844, Validation Accuracy:
0.9747676471865953
Epoch 17, Validation Loss: 0.47482802450804795, Validation Accuracy:
0.9748083549820041
Epoch 18, Validation Loss: 0.4718725991160343, Validation Accuracy:
0.9747299151107035
Epoch 19, Validation Loss: 0.4690712107618157, Validation Accuracy:
0.9748951302632857

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 95.57662327768784, Validation Accuracy:
0.025240000919396977
Epoch 1, Validation Loss: 37.66242291613785, Validation Accuracy:
0.025185866482716333
Epoch 2, Validation Loss: 75.88277981831477, Validation Accuracy:
0.025159514799038184
Epoch 3, Validation Loss: 75.50182862317295, Validation Accuracy:
0.025263238601512982
Epoch 4, Validation Loss: 83.02463202322683, Validation Accuracy: 0.02523508650059506
Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 90.04001800120616, Validation Accuracy: 0.02523917855857098
Epoch 1, Validation Loss: 88.708250211427, Validation Accuracy: 0.0252575963127895
Epoch 2, Validation Loss: 93.08137453519382, Validation Accuracy: 0.025217275788247437
Epoch 3, Validation Loss: 85.55410565927662, Validation Accuracy: 0.025249879245263732
Epoch 4, Validation Loss: 83.49016216079295, Validation Accuracy: 0.0252213960402868
Epoch 5, Validation Loss: 73.526475208273, Validation Accuracy: 0.025283574998914485
Epoch 6, Validation Loss: 71.63914408932253, Validation Accuracy: 0.02517232041121858
Epoch 7, Validation Loss: 74.58574510271437, Validation Accuracy: 0.025239881055783203
Epoch 8, Validation Loss: 74.783691330524, Validation Accuracy: 0.025212208500597556
Epoch 9, Validation Loss: 77.7973755015333, Validation Accuracy: 0.0252489504092318
Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 89.47236289694055, Validation Accuracy: 0.026101596190398334
Epoch 1, Validation Loss: 80.74597860625009, Validation Accuracy: 0.027513678929595022
Epoch 2, Validation Loss: 80.90408346848216, Validation Accuracy: 0.027360927634588014
Epoch 3, Validation Loss: 81.95129175517458, Validation Accuracy: 0.027157667761830064
Epoch 4, Validation Loss: 80.93578969042, Validation Accuracy: 0.027718038179988455
Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 94.22778066630399, Validation Accuracy: 0.02521661143319987
Epoch 1, Validation Loss: 91.49223153466919, Validation Accuracy: 0.02524147799867123
Epoch 2, Validation Loss: 88.89320080096905, Validation Accuracy: 0.025505053731839148
Epoch 3, Validation Loss: 86.43188096985924, Validation Accuracy: 0.02577893838504111
Epoch 4, Validation Loss: 85.3341448857234, Validation Accuracy: 0.025990117981288547

Epoch 5, Validation Loss: 85.94675590382616, Validation Accuracy: 0.025838697230874584

Epoch 6, Validation Loss: 83.80224400181925, Validation Accuracy: 0.0261920391935488

Epoch 7, Validation Loss: 84.83015734386207, Validation Accuracy: 0.02611921233611625

Epoch 8, Validation Loss: 85.88560080705741, Validation Accuracy: 0.025945258187894258

Epoch 9, Validation Loss: 83.50298035765995, Validation Accuracy: 0.026206797875248794

Epoch 10, Validation Loss: 82.75201132043124, Validation Accuracy: 0.026446766652188355

Epoch 11, Validation Loss: 79.83096069260212, Validation Accuracy: 0.029420857510047548

Epoch 12, Validation Loss: 82.20662306792683, Validation Accuracy: 0.02756002022378951

Epoch 13, Validation Loss: 82.87058489967517, Validation Accuracy: 0.02723671810954447

Epoch 14, Validation Loss: 83.0904024185673, Validation Accuracy: 0.02739110223389202

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.6614562265630396, Validation Accuracy: 0.9745923514013918

Epoch 1, Validation Loss: 0.6008631779301551, Validation Accuracy: 0.974845143928059

Epoch 2, Validation Loss: 0.576025916092449, Validation Accuracy: 0.9748997061453941

Epoch 3, Validation Loss: 0.5652544686279581, Validation Accuracy: 0.9747068890648548

Epoch 4, Validation Loss: 0.5603081752585418, Validation Accuracy: 0.9747541569819417

Epoch 5, Validation Loss: 0.5579191990584949, Validation Accuracy: 0.9747207224693906

Epoch 6, Validation Loss: 0.5566273060980861, Validation Accuracy: 0.9747105711447157

Epoch 7, Validation Loss: 0.5557286581093857, Validation Accuracy: 0.9748177262354111

Epoch 8, Validation Loss: 0.5550742835619905, Validation Accuracy: 0.9747596031024228

Epoch 9, Validation Loss: 0.5545646981625049, Validation Accuracy: 0.9747222356993839

Epoch 10, Validation Loss: 0.5541678504375903, Validation Accuracy: 0.9747230784172405

Epoch 11, Validation Loss: 0.5544181267913458, Validation Accuracy: 0.9746736472554175

Epoch 12, Validation Loss: 0.554552503318408, Validation Accuracy: 0.9747302378811412

Epoch 13, Validation Loss: 0.5543332227110567, Validation Accuracy: 0.9747831952699008

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 86.9397447079642, Validation Accuracy: 0.02945144229540867

Epoch 1, Validation Loss: 1.1914932813597081, Validation Accuracy: 0.9659979824550202

Epoch 2, Validation Loss: 0.5849987599749127, Validation Accuracy: 0.9745523404538056

Epoch 3, Validation Loss: 0.5823053096423374, Validation Accuracy: 0.9747356051703878

Epoch 4, Validation Loss: 0.5798601972553925, Validation Accuracy: 0.9747642045527102

Epoch 5, Validation Loss: 0.5752248058543903, Validation Accuracy: 0.9747865671413025

Epoch 6, Validation Loss: 0.5769061110451559, Validation Accuracy: 0.9747656315874196

Epoch 7, Validation Loss: 0.574837470025046, Validation Accuracy: 0.9747169926931266

Epoch 8, Validation Loss: 0.5746999671382289, Validation Accuracy: 0.9747750002553913

Epoch 9, Validation Loss: 0.5740800840091469, Validation Accuracy: 0.9747221945417519

Epoch 10, Validation Loss: 0.5739388180429823, Validation Accuracy: 0.9748057608731755

Epoch 11, Validation Loss: 0.573864481881002, Validation Accuracy: 0.9748001532371344

Epoch 12, Validation Loss: 0.5740222466494842, Validation Accuracy: 0.974783970247537

Epoch 13, Validation Loss: 0.5740596002739653, Validation Accuracy: 0.9747301275760549

Epoch 14, Validation Loss: 0.5740938961653792, Validation Accuracy: 0.9747240028717498

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 92.86025754867062, Validation Accuracy: 0.025423858684824864

Epoch 1, Validation Loss: 0.6243086038688868, Validation Accuracy: 0.9747601653344649

Epoch 2, Validation Loss: 0.5992102587489277, Validation Accuracy: 0.9748066817727798

Epoch 3, Validation Loss: 0.5837656993132371, Validation Accuracy: 0.9747374766596252

Epoch 4, Validation Loss: 0.581317407617498, Validation Accuracy: 0.9747922989668598

Epoch 5, Validation Loss: 0.5803582279321278, Validation Accuracy: 0.9747179747818248

Epoch 6, Validation Loss: 0.5797672821925237, Validation Accuracy: 0.9746919193983488

Epoch 7, Validation Loss: 0.5790075014897671, Validation Accuracy: 0.9749150724119435
Epoch 8, Validation Loss: 0.5784036403258445, Validation Accuracy: 0.9748355368205914
Epoch 9, Validation Loss: 0.5781422812057192, Validation Accuracy: 0.9747177798682972
Epoch 10, Validation Loss: 46.44289921294371, Validation Accuracy: 0.4358255165225921
Epoch 11, Validation Loss: 0.5711283080335291, Validation Accuracy:
0.9747752534864769
Epoch 12, Validation Loss: 31.441674473859536, Validation Accuracy:
0.5817558179923584
Epoch 13, Validation Loss: 0.5715377098573349, Validation Accuracy:
0.9748343152634349
Epoch 14, Validation Loss: 0.5768555981053903, Validation Accuracy:
0.9748089145940202
Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 96.44192732060813, Validation Accuracy:
0.025207915479642806
Epoch 1, Validation Loss: 0.7030540462167328, Validation Accuracy:
0.025092756319183947
Epoch 2, Validation Loss: 0.6293514144627687, Validation Accuracy: 0.9747691364489801
Epoch 3, Validation Loss: 0.598910904995561, Validation Accuracy: 0.9747367291841733
Epoch 4, Validation Loss: 0.5855152738597198, Validation Accuracy: 0.974762326934918
Epoch 5, Validation Loss: 0.5793418467192732, Validation Accuracy: 0.9747818470158306
Epoch 6, Validation Loss: 0.5762856938407084, Validation Accuracy: 0.9747744801739269
Epoch 7, Validation Loss: 0.5746054480744355, Validation Accuracy: 0.9747771449005134
Epoch 8, Validation Loss: 0.5735304110103446, Validation Accuracy: 0.974786459091873
Epoch 9, Validation Loss: 0.5727453687350744, Validation Accuracy: 0.9747099548747756
Epoch 10, Validation Loss: 0.5720497233696079, Validation Accuracy:
0.9747330779054917
Epoch 11, Validation Loss: 0.5713875064483056, Validation Accuracy:
0.9748247209844242
Epoch 12, Validation Loss: 0.5707589309505434, Validation Accuracy:
0.9748354893425705
Epoch 13, Validation Loss: 0.5701485668163442, Validation Accuracy:
0.9748279835559178

Epoch 14, Validation Loss: 0.5696116830811607, Validation Accuracy: 0.9747090557979381

Epoch 15, Validation Loss: 0.5690615085455087, Validation Accuracy: 0.9747172135022089

Epoch 16, Validation Loss: 0.5684899288430699, Validation Accuracy: 0.974816173652664

Epoch 17, Validation Loss: 0.5679901427134095, Validation Accuracy: 0.97473445369133

Epoch 18, Validation Loss: 0.5674598916588587, Validation Accuracy: 0.9747245840657319

Epoch 19, Validation Loss: 0.5669429599499288, Validation Accuracy: 0.9747734490167674

Tuning GIN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 94.33195134013818, Validation Accuracy: 0.025269799103436824

Epoch 1, Validation Loss: 94.16695744819735, Validation Accuracy: 0.025223029522670835

Epoch 2, Validation Loss: 93.04654371768014, Validation Accuracy: 0.025338925043163776

Epoch 3, Validation Loss: 92.81746446405984, Validation Accuracy: 0.02576528593058616

Epoch 4, Validation Loss: 0.8070057049282727, Validation Accuracy: 0.02524470737289521

Epoch 5, Validation Loss: 0.6806437846448817, Validation Accuracy: 0.9747187925515473

Epoch 6, Validation Loss: 0.6298688938540797, Validation Accuracy: 0.9748152917011558

Epoch 7, Validation Loss: 0.6072440148878926, Validation Accuracy: 0.974772510771101

Epoch 8, Validation Loss: 0.596106048257416, Validation Accuracy: 0.9748001563493949

Epoch 9, Validation Loss: 0.5900619596464758, Validation Accuracy: 0.9747728973370824

Epoch 10, Validation Loss: 0.5863796948794987, Validation Accuracy: 0.9748134972053333

Epoch 11, Validation Loss: 0.583799820827787, Validation Accuracy: 0.9748369677664903

Epoch 12, Validation Loss: 0.5818982164262246, Validation Accuracy: 0.9747490361301103

Epoch 13, Validation Loss: 0.5802773954554764, Validation Accuracy: 0.9747753549851259

Epoch 14, Validation Loss: 0.5788984214401719, Validation Accuracy: 0.9748104589855724

Epoch 15, Validation Loss: 0.5776588402078406, Validation Accuracy: 0.9747586263295358

Epoch 16, Validation Loss: 0.5765101300279792, Validation Accuracy: 0.9748451458593127

Epoch 17, Validation Loss: 0.5755079742105073, Validation Accuracy: 0.9747547911221484

Epoch 18, Validation Loss: 0.5746053176245678, Validation Accuracy: 0.9748046909939356

Epoch 19, Validation Loss: 0.573815505054985, Validation Accuracy: 0.9747645190875578

Tuning GIN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 92.67363824205422, Validation Accuracy: 0.025197606993997042

Epoch 1, Validation Loss: 93.1343264520612, Validation Accuracy: 0.025251003503324584

Epoch 2, Validation Loss: 89.34412503301654, Validation Accuracy: 0.02527617077251191

Epoch 3, Validation Loss: 94.02147634804396, Validation Accuracy: 0.02558512786174677

Epoch 4, Validation Loss: 0.7784183264961906, Validation Accuracy: 0.02532864899393165

Epoch 5, Validation Loss: 0.6659741406109434, Validation Accuracy: 0.9748507031892557

Epoch 6, Validation Loss: 0.6970162372435292, Validation Accuracy: 0.47550222544540827

Epoch 7, Validation Loss: 0.7349521474861921, Validation Accuracy: 0.441857256376909

Epoch 8, Validation Loss: 0.8086763581921977, Validation Accuracy: 0.025275569842943702

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.18049042278129, Validation Accuracy: 0.025217597903089417

Epoch 1, Validation Loss: 95.35535061743951, Validation Accuracy: 0.025295854964640478

Epoch 2, Validation Loss: 96.93637126610237, Validation Accuracy: 0.025253699167575548

Epoch 3, Validation Loss: 96.37080820618434, Validation Accuracy: 0.02533443342367357

Epoch 4, Validation Loss: 95.46736754613833, Validation Accuracy: 0.02536913094569049

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 95.06893440038336, Validation Accuracy: 0.025219550324152833

Epoch 1, Validation Loss: 90.55840350735572, Validation Accuracy: 0.025322277727383068

Epoch 2, Validation Loss: 0.9404338746153688, Validation Accuracy: 0.02525517047559433

Epoch 3, Validation Loss: 0.7670984469335664, Validation Accuracy: 0.02523892955473032

Epoch 4, Validation Loss: 0.8021912515607129, Validation Accuracy: 0.02523198299472673

Epoch 5, Validation Loss: 0.7620434570253339, Validation Accuracy: 0.02516524830665182

Epoch 6, Validation Loss: 0.7583879933463729, Validation Accuracy: 0.02512615455370032

Epoch 7, Validation Loss: 0.7389520717317946, Validation Accuracy: 0.025334992856722985

Epoch 8, Validation Loss: 0.7348648259420845, Validation Accuracy: 0.025213927449913253

Epoch 9, Validation Loss: 0.7202768819799494, Validation Accuracy: 0.02518101408767367

Epoch 10, Validation Loss: 0.7307992056936543, Validation Accuracy: 0.025119608058505136

Epoch 11, Validation Loss: 0.7162055260786052, Validation Accuracy: 0.02519207037427854

Epoch 12, Validation Loss: 0.7126765091425136, Validation Accuracy: 0.025141975813041346

Epoch 13, Validation Loss: 0.7061513273355091, Validation Accuracy: 0.02524587901909028

Epoch 14, Validation Loss: 0.7041060242700222, Validation Accuracy: 0.025164317809674888

Epoch 15, Validation Loss: 0.6897139006453767, Validation Accuracy: 0.9747900017872189

Epoch 16, Validation Loss: 0.6988916546476094, Validation Accuracy: 0.025218606385886574

Epoch 17, Validation Loss: 0.7034160222664069, Validation Accuracy: 0.02524510868038441

Epoch 18, Validation Loss: 0.7182208611710788, Validation Accuracy: 0.025159113564910667

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 94.91164947206862, Validation Accuracy: 0.0252033641956384

Epoch 1, Validation Loss: 93.69514698189482, Validation Accuracy: 0.02531658507169796

Epoch 2, Validation Loss: 93.7624773730711, Validation Accuracy: 0.025316132328522162

Epoch 3, Validation Loss: 92.84921584590789, Validation Accuracy:
0.025690932311621967

Epoch 4, Validation Loss: 93.83651659565587, Validation Accuracy: 0.02565870978453836

Epoch 5, Validation Loss: 93.6520272531817, Validation Accuracy: 0.02566002258408997

Epoch 6, Validation Loss: 94.85979338615171, Validation Accuracy:
0.025685850546686907

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 2.2287151352051766, Validation Accuracy:
0.025292847744721077

Epoch 1, Validation Loss: 2.2722140056619575, Validation Accuracy: 0.0251895603834127

Epoch 2, Validation Loss: 2.287125460267363, Validation Accuracy:
0.025212209146386635

Epoch 3, Validation Loss: 2.3085032308072075, Validation Accuracy:
0.025238582880257824

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 2.1927448407592016, Validation Accuracy:
0.025138359302572067

Epoch 1, Validation Loss: 2.128318131709513, Validation Accuracy:
0.025273773670214803

Epoch 2, Validation Loss: 2.095944753355779, Validation Accuracy:
0.025192011504087987

Epoch 3, Validation Loss: 2.140065011256386, Validation Accuracy:
0.025078946561608976

Epoch 4, Validation Loss: 2.1612644588976875, Validation Accuracy:
0.025146629064230683

Epoch 5, Validation Loss: 2.1441437517738815, Validation Accuracy:
0.025259391771019678

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 2.076897608139379, Validation Accuracy:
0.025188189827148887

Epoch 1, Validation Loss: 2.0459689517174997, Validation Accuracy:
0.025266671096277594

Epoch 2, Validation Loss: 2.0458394552282897, Validation Accuracy:
0.025238100104232664

Epoch 3, Validation Loss: 2.0457530622150997, Validation Accuracy:
0.025279112357570323

Epoch 4, Validation Loss: 2.0457999330596355, Validation Accuracy:
0.025265002772022246

Epoch 5, Validation Loss: 2.04580214774934, Validation Accuracy: 0.02524629440898282

Epoch 6, Validation Loss: 2.0460094133618454, Validation Accuracy:
0.025119849536445502

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 97.84764750364697, Validation Accuracy:
0.025098640107259144

Epoch 1, Validation Loss: 97.73656895261249, Validation Accuracy:
0.025244359990090236

Epoch 2, Validation Loss: 4.049755869077393, Validation Accuracy: 0.02525204817062429

Epoch 3, Validation Loss: 3.603691806864206, Validation Accuracy:
0.025296798054721185

Epoch 4, Validation Loss: 3.531527117523307, Validation Accuracy: 0.0252294046718849

Epoch 5, Validation Loss: 3.4843636174355783, Validation Accuracy:
0.025188678763227952

Epoch 6, Validation Loss: 3.4693505568776475, Validation Accuracy:
0.025257737225531568

Epoch 7, Validation Loss: 3.3519491859464434, Validation Accuracy:
0.02523906728629569

Epoch 8, Validation Loss: 3.356876690393642, Validation Accuracy:
0.025180361361169634

Epoch 9, Validation Loss: 3.3330729693987826, Validation Accuracy:
0.02527343350710416

Epoch 10, Validation Loss: 3.343420738026167, Validation Accuracy: 0.02511374115807786

Epoch 11, Validation Loss: 3.3133710566584584, Validation Accuracy: 0.02523837377109477

Epoch 12, Validation Loss: 3.2974808553312314, Validation Accuracy: 0.025283209761730787

Epoch 13, Validation Loss: 3.299470279707802, Validation Accuracy: 0.025321206797941007

Epoch 14, Validation Loss: 3.295031965222607, Validation Accuracy: 0.025145196196920027

Epoch 15, Validation Loss: 3.2760293708545696, Validation Accuracy: 0.025298607350491973

Epoch 16, Validation Loss: 3.2786309719085693, Validation Accuracy: 0.02521053492222472

Epoch 17, Validation Loss: 3.3496805822878852, Validation Accuracy: 0.025258317900249058

Epoch 18, Validation Loss: 3.414581096497718, Validation Accuracy: 0.025225114729300176

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 97.85428835203867, Validation Accuracy: 0.025214034424348955

Epoch 1, Validation Loss: 97.86798517875577, Validation Accuracy: 0.02515877454397806

Epoch 2, Validation Loss: 8.555051921910742, Validation Accuracy: 0.025195704087757162

Epoch 3, Validation Loss: 3.9543994804174076, Validation Accuracy: 0.025233974293479372

Epoch 4, Validation Loss: 3.9472793148409937, Validation Accuracy: 0.025179947995157114

Epoch 5, Validation Loss: 3.9337152943717633, Validation Accuracy: 0.025248010298429695

Epoch 6, Validation Loss: 3.92539018969382, Validation Accuracy: 0.025288519012368386

Epoch 7, Validation Loss: 3.9194874035809235, Validation Accuracy: 0.02527809997802793

Epoch 8, Validation Loss: 3.905648797676522, Validation Accuracy: 0.025243908668335292

Epoch 9, Validation Loss: 3.89644007351499, Validation Accuracy: 0.025206305408650775

Epoch 10, Validation Loss: 3.8971317045150267, Validation Accuracy: 0.025218328896065737

Epoch 11, Validation Loss: 3.877663161559377, Validation Accuracy: 0.025230049203194375

Epoch 12, Validation Loss: 3.86593521972448, Validation Accuracy: 0.02524907944733621

Epoch 13, Validation Loss: 3.8542328052426096, Validation Accuracy: 0.025248706013397168

Epoch 14, Validation Loss: 3.7390226122759116, Validation Accuracy: 0.02528280861026341

Epoch 15, Validation Loss: 3.831290065798511, Validation Accuracy: 0.025291103151935664

Epoch 16, Validation Loss: 3.3731393009498163, Validation Accuracy: 0.025185325255085746

Epoch 17, Validation Loss: 3.7969622919636388, Validation Accuracy: 0.02511439440585168

Epoch 18, Validation Loss: 3.775998789974241, Validation Accuracy: 0.025267411092835323

Epoch 19, Validation Loss: 3.7664664755979778, Validation Accuracy: 0.02518470829884423

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.67637611559543, Validation Accuracy: 0.02514683678187936

Epoch 1, Validation Loss: 2.846704753397712, Validation Accuracy: 0.02517810963580796

Epoch 2, Validation Loss: 3.115067839326693, Validation Accuracy: 0.025176768708873178

Epoch 3, Validation Loss: 3.0260589702549407, Validation Accuracy: 0.025153134367261826

Epoch 4, Validation Loss: 3.0459078151002417, Validation Accuracy: 0.02524911850375594

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.86180712981496, Validation Accuracy: 0.025200917604622765

Epoch 1, Validation Loss: 97.79682163210128, Validation Accuracy: 0.025078578182096953

Epoch 2, Validation Loss: 2.773358320775754, Validation Accuracy: 0.025189753441875795

Epoch 3, Validation Loss: 71.86398953894528, Validation Accuracy: 0.02520879586930362

Epoch 4, Validation Loss: 3.512146931428176, Validation Accuracy: 0.0252426936439812

Epoch 5, Validation Loss: 3.0080882361154107, Validation Accuracy: 0.025239325214032236

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.81135657525832, Validation Accuracy: 0.025162808403442927

Epoch 1, Validation Loss: 97.86258790274115, Validation Accuracy: 0.02532738376503462

Epoch 2, Validation Loss: 97.8712643985417, Validation Accuracy: 0.025217275788247437

Epoch 3, Validation Loss: 89.19546191804758, Validation Accuracy: 0.02519154152620288

Epoch 4, Validation Loss: 3.1266972474365615, Validation Accuracy: 0.025255712814642384

Epoch 5, Validation Loss: 3.374436868331568, Validation Accuracy: 0.025260796582498076

Epoch 6, Validation Loss: 3.413016754699404, Validation Accuracy: 0.025229562955068785

Epoch 7, Validation Loss: 3.5150386376061453, Validation Accuracy: 0.025196105986662238

Early stopping due to no improvement.

Tuning GIN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 2.1253491779119145, Validation Accuracy: 0.9748035278126949

Epoch 1, Validation Loss: 2.124985545451889, Validation Accuracy: 0.9748146936856602

Epoch 2, Validation Loss: 2.2531620452443955, Validation Accuracy: 0.7307940936743855

Epoch 3, Validation Loss: 2.6602744217176295, Validation Accuracy: 0.2610450590381206

Epoch 4, Validation Loss: 1.9520593786949556, Validation Accuracy: 0.18735809784066096

Epoch 5, Validation Loss: 1.857734840464947, Validation Accuracy: 0.14914637073504552

Epoch 6, Validation Loss: 95.92092193149159, Validation Accuracy: 0.04591150162273411

Epoch 7, Validation Loss: 1.9716109226714293, Validation Accuracy: 0.04448411299919812

Epoch 8, Validation Loss: 1.9804737488034345, Validation Accuracy: 0.0405574606614096

Early stopping due to no improvement.

Best parameters for GIN: {'learning_rate': 0.0001, 'hidden_channels': 32, 'dropout_rate': 0.5, 'heads': 1}

Best validation accuracy for GIN: 0.9748951302632857

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 93.61455903159774, Validation Accuracy: 0.03128097189157156

Epoch 1, Validation Loss: 79.8027080288596, Validation Accuracy: 0.05114637997373571

Epoch 2, Validation Loss: 37.1285139582589, Validation Accuracy: 0.5890758727783071

Epoch 3, Validation Loss: 19.247404206627355, Validation Accuracy: 0.7744641716694342

Epoch 4, Validation Loss: 1.2332687297692666, Validation Accuracy: 0.13990078067522277

Epoch 5, Validation Loss: 10.554567413945351, Validation Accuracy: 0.1761670868358071

Epoch 6, Validation Loss: 14.650520496273751, Validation Accuracy: 0.3314948460192364

Epoch 7, Validation Loss: 21.562045894840516, Validation Accuracy: 0.06399059412899845

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 26.53148240546139, Validation Accuracy: 0.7052379881874477

Epoch 1, Validation Loss: 8.903814423986463, Validation Accuracy: 0.8909640924490411

Epoch 2, Validation Loss: 7.609157029659517, Validation Accuracy: 0.9038354456892104

Epoch 3, Validation Loss: 0.6686712317076273, Validation Accuracy: 0.9747451012443554

Epoch 4, Validation Loss: 1.48039619169815, Validation Accuracy: 0.9654394481349003

Epoch 5, Validation Loss: 0.9480549401000475, Validation Accuracy: 0.9704896505561772

Epoch 6, Validation Loss: 1.6418685143993748, Validation Accuracy: 0.9600361705225567

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 52.0990779285987, Validation Accuracy: 0.43068355982425666

Epoch 1, Validation Loss: 15.29727716836385, Validation Accuracy: 0.8201691966099356

Epoch 2, Validation Loss: 14.987012034018637, Validation Accuracy: 0.8232841434002371

Epoch 3, Validation Loss: 6.029300501935239, Validation Accuracy: 0.07333505295498252

Epoch 4, Validation Loss: 5.686981629201259, Validation Accuracy:
0.028738877065870253

Epoch 5, Validation Loss: 0.7109546352261054, Validation Accuracy:
0.027634654439094172

Epoch 6, Validation Loss: 0.6539631738852034, Validation Accuracy: 0.9747129313691437

Epoch 7, Validation Loss: 0.60424236195259, Validation Accuracy: 0.9747306992621058

Epoch 8, Validation Loss: 0.5728077647407949, Validation Accuracy: 0.974785321372819

Epoch 9, Validation Loss: 0.5800979832561672, Validation Accuracy: 0.9747218561314249

Epoch 10, Validation Loss: 0.5518926694138766, Validation Accuracy:
0.9747523260150929

Epoch 11, Validation Loss: 0.5160129006683974, Validation Accuracy:
0.9748726646674466

Epoch 12, Validation Loss: 0.5083566433738538, Validation Accuracy:
0.9747482231271939

Epoch 13, Validation Loss: 0.514974943313646, Validation Accuracy: 0.9746889746889746

Epoch 14, Validation Loss: 0.4973796020370559, Validation Accuracy:
0.9748084193317667

Epoch 15, Validation Loss: 0.4930050858936594, Validation Accuracy:
0.9748010813407398

Epoch 16, Validation Loss: 0.48935955504034057, Validation Accuracy:
0.9747750601627844

Epoch 17, Validation Loss: 0.4874992492624903, Validation Accuracy:
0.9748754890361356

Epoch 18, Validation Loss: 0.48475886848073446, Validation Accuracy:
0.9747692354871355

Epoch 19, Validation Loss: 0.4803135778117121, Validation Accuracy:
0.9747912045224538

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 94.72252662601898, Validation Accuracy:
0.044457161251095334

Epoch 1, Validation Loss: 77.76281301910173, Validation Accuracy: 0.21668757809844813

Epoch 2, Validation Loss: 8.43439156068466, Validation Accuracy: 0.13204085439552718

Epoch 3, Validation Loss: 8.075538742926813, Validation Accuracy: 0.8964231061060882

Epoch 4, Validation Loss: 4.730076270718729, Validation Accuracy: 0.929841909857701

Epoch 5, Validation Loss: 2.1658324801892266, Validation Accuracy: 0.9568326210298554

Epoch 6, Validation Loss: 1.156610640713358, Validation Accuracy: 0.9678973614829651

Epoch 7, Validation Loss: 0.46552105222091483, Validation Accuracy:
0.9747185488380644

Epoch 8, Validation Loss: 0.48039723256089845, Validation Accuracy:
0.9746990045174874

Epoch 9, Validation Loss: 0.641036022389793, Validation Accuracy: 0.9748679918151093

Epoch 10, Validation Loss: 0.5488666600684078, Validation Accuracy:
0.9747649223221586

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 57.18423712756439, Validation Accuracy: 0.4436972900608312

Epoch 1, Validation Loss: 97.6563215232073, Validation Accuracy: 0.02533255685649482

Epoch 2, Validation Loss: 97.69383281395393, Validation Accuracy:
0.025287315206115765

Epoch 3, Validation Loss: 97.4100583362816, Validation Accuracy: 0.025418424205881827

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.4470204052795, Validation Accuracy: 0.028643904133734563

Epoch 1, Validation Loss: 89.88212572197169, Validation Accuracy: 0.10501452931653482

Epoch 2, Validation Loss: 66.40016111812875, Validation Accuracy: 0.30153658324776894

Epoch 3, Validation Loss: 22.879865671135946, Validation Accuracy: 0.746882773909801

Epoch 4, Validation Loss: 10.672049906058584, Validation Accuracy: 0.8699893207703352

Epoch 5, Validation Loss: 3.398275072536161, Validation Accuracy: 0.9422890756903524

Epoch 6, Validation Loss: 0.8755310798992886, Validation Accuracy:
0.03536348285472692

Epoch 7, Validation Loss: 0.6206445982379298, Validation Accuracy: 0.9747875976437771

Epoch 8, Validation Loss: 0.37713672631135947, Validation Accuracy:
0.9747629232691674

Epoch 9, Validation Loss: 0.42077061326864634, Validation Accuracy:
0.9748600997627251

Epoch 10, Validation Loss: 0.45964447839680145, Validation Accuracy:
0.9747491519189112

Epoch 11, Validation Loss: 0.4860120460797776, Validation Accuracy: 0.9748429921770645

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.75176842928525, Validation Accuracy: 0.025212874942198673

Epoch 1, Validation Loss: 97.74793211224653, Validation Accuracy: 0.025252873651319237

Epoch 2, Validation Loss: 97.78064351046352, Validation Accuracy: 0.025199823230839576

Epoch 3, Validation Loss: 8.494455869972853, Validation Accuracy: 0.9035720215062003

Epoch 4, Validation Loss: 7.718134243050521, Validation Accuracy: 0.9112668609566525

Epoch 5, Validation Loss: 56.703337927314244, Validation Accuracy: 0.4429985154599136

Epoch 6, Validation Loss: 64.83651905675089, Validation Accuracy: 0.36400709310466417

Epoch 7, Validation Loss: 64.20566715496054, Validation Accuracy: 0.3651154890436746

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.74078995773277, Validation Accuracy: 0.025144770986999375

Epoch 1, Validation Loss: 97.79461738075275, Validation Accuracy: 0.025311930213435342

Epoch 2, Validation Loss: 97.80043609089059, Validation Accuracy: 0.02516502493255947

Epoch 3, Validation Loss: 96.75775502396577, Validation Accuracy: 0.0357424824276987

Epoch 4, Validation Loss: 97.76238970129425, Validation Accuracy: 0.025229182094430685

Epoch 5, Validation Loss: 94.6618181138713, Validation Accuracy: 0.05661703084438812

Epoch 6, Validation Loss: 97.77967968886307, Validation Accuracy: 0.025251092902457657

Epoch 7, Validation Loss: 97.69183766102377, Validation Accuracy: 0.02521177945822256

Epoch 8, Validation Loss: 97.6797619575898, Validation Accuracy: 0.02541286325070109

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.79252315928268, Validation Accuracy: 0.025219869457297827

Epoch 1, Validation Loss: 97.77597134876488, Validation Accuracy: 0.02524879594261405

Epoch 2, Validation Loss: 97.68902464835874, Validation Accuracy: 0.025323827744840852

Epoch 3, Validation Loss: 97.70861106474997, Validation Accuracy: 0.025251634763543813

Epoch 4, Validation Loss: 94.47236161433142, Validation Accuracy: 0.026150651659221688

Epoch 5, Validation Loss: 91.53288909045993, Validation Accuracy: 0.04862390243030097

Epoch 6, Validation Loss: 87.5314973767283, Validation Accuracy: 0.06936506273745315

Epoch 7, Validation Loss: 76.04017337291471, Validation Accuracy: 0.18588088030552682

Epoch 8, Validation Loss: 85.3570747730454, Validation Accuracy: 0.08621513414905223

Epoch 9, Validation Loss: 59.94866559419679, Validation Accuracy: 0.33281997451084055

Epoch 10, Validation Loss: 74.01190603933027, Validation Accuracy: 0.21651310040320726

Epoch 11, Validation Loss: 69.84406329739478, Validation Accuracy: 0.25510013770691164

Epoch 12, Validation Loss: 74.01117374051002, Validation Accuracy: 0.22385234384978925

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 78.17557976115727, Validation Accuracy: 0.16548107696669537

Epoch 1, Validation Loss: 59.25427047312999, Validation Accuracy: 0.3312164716701579

Epoch 2, Validation Loss: 69.16145220879585, Validation Accuracy: 0.025250525573660778

Epoch 3, Validation Loss: 1.2764384515823857, Validation Accuracy: 0.0458791763206229

Epoch 4, Validation Loss: 2.5740766486813946, Validation Accuracy: 0.9556935024460027

Epoch 5, Validation Loss: 2.8340345576738306, Validation Accuracy: 0.025165122963909294

Epoch 6, Validation Loss: 2.8752077059177843, Validation Accuracy: 0.025279513423033185

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 78.33089435973179, Validation Accuracy: 0.18203250516593572

Epoch 1, Validation Loss: 30.442809473048367, Validation Accuracy: 0.6788656527249683

Epoch 2, Validation Loss: 25.592106978887365, Validation Accuracy: 0.7249284179929453

Epoch 3, Validation Loss: 1.5710840561327803, Validation Accuracy: 0.2622154206192468

Epoch 4, Validation Loss: 1.3094240743897985, Validation Accuracy: 0.2591860298775877

Epoch 5, Validation Loss: 1.2434518516211592, Validation Accuracy: 0.24975476421601187

Epoch 6, Validation Loss: 20.225448178594224, Validation Accuracy: 0.7788145919172774

Epoch 7, Validation Loss: 1.2829269140441129, Validation Accuracy: 0.21882663696558488

Epoch 8, Validation Loss: 1.0434985380832373, Validation Accuracy: 0.9747934781220873

Epoch 9, Validation Loss: 0.9549563291572756, Validation Accuracy: 0.9747648818724626

Epoch 10, Validation Loss: 0.9327361077698821, Validation Accuracy: 0.9747649299196125

Epoch 11, Validation Loss: 0.9334113186146722, Validation Accuracy: 0.974840983983447

Epoch 12, Validation Loss: 0.9305583184432451, Validation Accuracy: 0.9748140765161389

Epoch 13, Validation Loss: 0.9113426306666275, Validation Accuracy: 0.9747520795184353

Epoch 14, Validation Loss: 0.8932503684061041, Validation Accuracy: 0.9748190960937021

Epoch 15, Validation Loss: 0.9133826319322397, Validation Accuracy: 0.9747900018393999

Epoch 16, Validation Loss: 0.8996457580855999, Validation Accuracy: 0.9746607513658062

Epoch 17, Validation Loss: 0.8755322044932516, Validation Accuracy: 0.9748568303609076

Epoch 18, Validation Loss: 0.8353066108658651, Validation Accuracy: 0.9747313819933309

Epoch 19, Validation Loss: 0.8440504341984801, Validation Accuracy: 0.9746227533890854

Tuning GCN with SMOTE and lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 97.36857705317419, Validation Accuracy: 0.028638990395787527

Epoch 1, Validation Loss: 49.27389418280154, Validation Accuracy: 0.025288901039098408

Epoch 2, Validation Loss: 1.0058301907615093, Validation Accuracy: 0.02527985860850954

Epoch 3, Validation Loss: 1.060707778552034, Validation Accuracy: 0.025228871395099866

Epoch 4, Validation Loss: 1.085811731241477, Validation Accuracy: 0.0252520866749078

Epoch 5, Validation Loss: 1.119884348388937, Validation Accuracy: 0.025293851660156498

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 97.82277363287308, Validation Accuracy: 0.025185647043190727

Epoch 1, Validation Loss: 84.88474602143167, Validation Accuracy: 0.13354126115632392

Epoch 2, Validation Loss: 37.70204062852315, Validation Accuracy: 0.13393041892212937

Epoch 3, Validation Loss: 6.5779888303788665, Validation Accuracy: 0.15819155647618635

Epoch 4, Validation Loss: 2.111731443008773, Validation Accuracy: 0.12194635913524672

Epoch 5, Validation Loss: 14.0457192971452, Validation Accuracy: 0.09070445997874253

Epoch 6, Validation Loss: 28.539722611679334, Validation Accuracy: 0.6948143154109782

Epoch 7, Validation Loss: 2.1261255511500994, Validation Accuracy: 0.9747468941362212

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 97.77863236041578, Validation Accuracy: 0.025246835523878863

Epoch 1, Validation Loss: 97.50308066621312, Validation Accuracy: 0.027981299816063763

Epoch 2, Validation Loss: 7.4187415372349195, Validation Accuracy: 0.050906303889634026

Epoch 3, Validation Loss: 13.51436879942494, Validation Accuracy: 0.03345114483153126

Epoch 4, Validation Loss: 14.003544731412276, Validation Accuracy: 0.02516261554262239

Epoch 5, Validation Loss: 10.62642293828297, Validation Accuracy: 0.02739544124331585

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.74846927462973, Validation Accuracy: 0.025326933049936006

Epoch 1, Validation Loss: 97.77862501499375, Validation Accuracy: 0.025222771771342148

Epoch 2, Validation Loss: 39.34454749239881, Validation Accuracy: 0.5677825968058108

Epoch 3, Validation Loss: 4.176387959615172, Validation Accuracy: 0.03310417417118215

Epoch 4, Validation Loss: 1.5699122716712004, Validation Accuracy: 0.07816484319506972

Epoch 5, Validation Loss: 1.4157094267698436, Validation Accuracy: 0.08569406908249334

Epoch 6, Validation Loss: 1.6549253904494103, Validation Accuracy: 0.07699084761690739

Epoch 7, Validation Loss: 1.641882201134419, Validation Accuracy: 0.07294205408830097

Epoch 8, Validation Loss: 1.6652135599044062, Validation Accuracy: 0.07163162048471258

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.59420301186536, Validation Accuracy: 0.02530054937897955

Epoch 1, Validation Loss: 97.58021233040405, Validation Accuracy: 0.025283416887790153

Epoch 2, Validation Loss: 97.49356567534265, Validation Accuracy: 0.025321244437173613

Epoch 3, Validation Loss: 97.30333244001895, Validation Accuracy: 0.02577893838504111

Epoch 4, Validation Loss: 41.17726659083337, Validation Accuracy: 0.5665161931477067

Epoch 5, Validation Loss: 97.51983665295926, Validation Accuracy: 0.02563467207545049

Epoch 6, Validation Loss: 10.905466049539836, Validation Accuracy: 0.02519428844331732

Epoch 7, Validation Loss: 2.650490914030051, Validation Accuracy: 0.025278531255267956

Epoch 8, Validation Loss: 2.518672467461295, Validation Accuracy: 0.025271090107925154

Epoch 9, Validation Loss: 2.561103093121247, Validation Accuracy: 0.02519245657111759

Epoch 10, Validation Loss: 2.582742879171821, Validation Accuracy: 0.025186664861537204

Epoch 11, Validation Loss: 2.6103603975944423, Validation Accuracy: 0.02522182791825389

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.77947647814123, Validation Accuracy: 0.025280949108550204

Epoch 1, Validation Loss: 97.77146854826593, Validation Accuracy: 0.025292300932655193

Epoch 2, Validation Loss: 97.77452129051643, Validation Accuracy: 0.025271957120448007

Epoch 3, Validation Loss: 97.78126425541956, Validation Accuracy: 0.025360476495884833

Epoch 4, Validation Loss: 97.8386937560278, Validation Accuracy: 0.025251467425453766

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.83310008463138, Validation Accuracy: 0.02524452439111638

Epoch 1, Validation Loss: 97.82106122189657, Validation Accuracy: 0.025274714047070483

Epoch 2, Validation Loss: 97.79486248688426, Validation Accuracy: 0.025310438767087228

Epoch 3, Validation Loss: 5.251181223256417, Validation Accuracy: 0.6215005713613739

Epoch 4, Validation Loss: 3.029916055336884, Validation Accuracy: 0.6239648198447965

Epoch 5, Validation Loss: 1.9704044081880792, Validation Accuracy: 0.3099995658913145

Epoch 6, Validation Loss: 2.3112003650913757, Validation Accuracy: 0.19308365443296233

Epoch 7, Validation Loss: 3.946368370547188, Validation Accuracy: 0.14081557068236678

Epoch 8, Validation Loss: 3.7057262116271272, Validation Accuracy: 0.1395964755459073

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 97.8609143202713, Validation Accuracy: 0.025261415283054055

Epoch 1, Validation Loss: 16.279263783329473, Validation Accuracy: 0.025326801559043936

Epoch 2, Validation Loss: 14.51116001635568, Validation Accuracy: 0.02524227218753591

Epoch 3, Validation Loss: 13.977630950085283, Validation Accuracy: 0.025276291788654027

Epoch 4, Validation Loss: 7.935434764431369, Validation Accuracy: 0.025191188832987963

Epoch 5, Validation Loss: 3.818086532372103, Validation Accuracy: 0.937731174006335

Epoch 6, Validation Loss: 5.664879686483379, Validation Accuracy: 0.02820993774852038

Epoch 7, Validation Loss: 6.20985964924171, Validation Accuracy: 0.029201815344616664

Epoch 8, Validation Loss: 6.52764732961915, Validation Accuracy: 0.030664190713130812

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 97.84922197971392, Validation Accuracy: 0.02527201271522096

Epoch 1, Validation Loss: 20.33036016116367, Validation Accuracy: 0.025268858405497228

Epoch 2, Validation Loss: 92.46743687329162, Validation Accuracy: 0.0783339633629277

Epoch 3, Validation Loss: 66.87653404074922, Validation Accuracy: 0.3352907505647379

Epoch 4, Validation Loss: 22.68258417510513, Validation Accuracy: 0.02524541671669089

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 97.86614276516822, Validation Accuracy: 0.025261700176042394

Epoch 1, Validation Loss: 31.746951196980536, Validation Accuracy: 0.02524948009013474

Epoch 2, Validation Loss: 44.67514075357328, Validation Accuracy: 0.025292649084297757

Epoch 3, Validation Loss: 44.11284355460562, Validation Accuracy: 0.025251621675501327

Epoch 4, Validation Loss: 42.88305130253359, Validation Accuracy: 0.025123356523338136

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 97.85249943887034, Validation Accuracy: 0.025297634254764702

Epoch 1, Validation Loss: 36.23095826712199, Validation Accuracy: 0.025248088581541085

Epoch 2, Validation Loss: 7.45657317750803, Validation Accuracy: 0.04497260571384784

Epoch 3, Validation Loss: 7.0276211674692615, Validation Accuracy: 0.027467655423897296

Epoch 4, Validation Loss: 6.658642292022705, Validation Accuracy: 0.025166307026392064

Epoch 5, Validation Loss: 6.663289561165178, Validation Accuracy: 0.025194234307912493

Epoch 6, Validation Loss: 6.600840078689916, Validation Accuracy: 0.02524936301581663

Epoch 7, Validation Loss: 6.61592032950806, Validation Accuracy: 0.025238382372479485

Epoch 8, Validation Loss: 6.602460868305367, Validation Accuracy: 0.025129055246628982

Epoch 9, Validation Loss: 6.6615545092977895, Validation Accuracy: 0.025209053491634027

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 97.86978257323612, Validation Accuracy: 0.025212059875128104

Epoch 1, Validation Loss: 17.401864028450277, Validation Accuracy: 0.6363132302927942

Epoch 2, Validation Loss: 34.41741277029733, Validation Accuracy: 0.6338836198859239

Epoch 3, Validation Loss: 2.131532265441885, Validation Accuracy: 0.9747523121365137

Epoch 4, Validation Loss: 2.1352923970216557, Validation Accuracy: 0.9747007464097233

Epoch 5, Validation Loss: 2.1310704735017594, Validation Accuracy: 0.974771732077072

Epoch 6, Validation Loss: 2.133730938320716, Validation Accuracy: 0.9747174513679286

Epoch 7, Validation Loss: 2.131513992181191, Validation Accuracy: 0.9747440307903695

Epoch 8, Validation Loss: 2.1348609785657957, Validation Accuracy: 0.9747176656957433

Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.87105912428636, Validation Accuracy: 0.02520804367383659

Epoch 1, Validation Loss: 62.13432859013749, Validation Accuracy:
0.039591719966487526

Epoch 2, Validation Loss: 13.078932124982696, Validation Accuracy:
0.03844090690807287

Epoch 3, Validation Loss: 10.008837576835386, Validation Accuracy:
0.028514497381530206

Epoch 4, Validation Loss: 10.176774020230503, Validation Accuracy:
0.028431212254365977

Epoch 5, Validation Loss: 10.131384693363465, Validation Accuracy:
0.027987696143803874

Epoch 6, Validation Loss: 9.306638908149587, Validation Accuracy: 0.025254717703838

Epoch 7, Validation Loss: 8.680994729546104, Validation Accuracy:
0.025269558996371812

Epoch 8, Validation Loss: 8.295980903114337, Validation Accuracy: 0.02528646418431749

Epoch 9, Validation Loss: 8.207876500065806, Validation Accuracy: 0.02519503609508872

Epoch 10, Validation Loss: 8.156561948525402, Validation Accuracy:
0.02511984023005238

Epoch 11, Validation Loss: 8.067394931026486, Validation Accuracy: 0.0251829899211834

Epoch 12, Validation Loss: 7.996179650498383, Validation Accuracy:
0.025264700924984805

Epoch 13, Validation Loss: 8.050131009766837, Validation Accuracy:
0.02526293738807438

Epoch 14, Validation Loss: 7.497683683636763, Validation Accuracy:
0.025235278781713433

Epoch 15, Validation Loss: 6.142115081806041, Validation Accuracy: 0.0738492355490148

Epoch 16, Validation Loss: 6.181562096546069, Validation Accuracy:
0.07232292981586438

Epoch 17, Validation Loss: 5.313045304703062, Validation Accuracy:
0.07269444685621479

Epoch 18, Validation Loss: 5.314644489927268, Validation Accuracy:
0.07315454401576532

Epoch 19, Validation Loss: 5.335777427067532, Validation Accuracy:
0.07248128060821737

Tuning GCN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.85433532109036, Validation Accuracy:
0.025297181850000128

Epoch 1, Validation Loss: 97.8507813105808, Validation Accuracy: 0.025326511480585564

Epoch 2, Validation Loss: 97.87068293644832, Validation Accuracy: 0.02520767981035487
Epoch 3, Validation Loss: 97.86794390808559, Validation Accuracy: 0.02524384419511622
Epoch 4, Validation Loss: 97.86638567524571, Validation Accuracy:
0.025231144982001477
Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.83687877418386, Validation Accuracy:
0.025282699818387558
Epoch 1, Validation Loss: 93.83522272228308, Validation Accuracy: 0.06765189925174797
Epoch 2, Validation Loss: 4.047920983867077, Validation Accuracy: 0.09662404680095543
Epoch 3, Validation Loss: 4.600092941566969, Validation Accuracy: 0.09273078554744003
Epoch 4, Validation Loss: 4.68861852656523, Validation Accuracy: 0.08681366412018703
Epoch 5, Validation Loss: 4.820932322045413, Validation Accuracy: 0.03196480039246949
Early stopping due to no improvement.

Tuning GCN with SMOTE and lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.86440958633612, Validation Accuracy:
0.025244484876051854
Epoch 1, Validation Loss: 97.86719863172205, Validation Accuracy: 0.02527378442272059
Epoch 2, Validation Loss: 82.68651537268097, Validation Accuracy: 0.18772659102348244
Epoch 3, Validation Loss: 77.35978207458042, Validation Accuracy: 0.24316475837532595
Epoch 4, Validation Loss: 92.62251419938232, Validation Accuracy: 0.08010238227826114
Epoch 5, Validation Loss: 52.197882326897556, Validation Accuracy:
0.45222759059447554
Epoch 6, Validation Loss: 51.26222230601252, Validation Accuracy: 0.4617176425515612
Epoch 7, Validation Loss: 41.205675785949744, Validation Accuracy: 0.5745821346264889
Epoch 8, Validation Loss: 40.8477836761522, Validation Accuracy: 0.5780038932970912
Epoch 9, Validation Loss: 34.158672806642784, Validation Accuracy: 0.6392879769471296
Epoch 10, Validation Loss: 4.741024276458892, Validation Accuracy: 0.9471828018499554
Epoch 11, Validation Loss: 2.1340930092127683, Validation Accuracy:
0.9747190508914498
Epoch 12, Validation Loss: 2.1273021992323713, Validation Accuracy:
0.9748051815324867

Epoch 13, Validation Loss: 2.13199143788359, Validation Accuracy: 0.9747284302604822
Epoch 14, Validation Loss: 2.1268703334088954, Validation Accuracy: 0.974808844485987
Epoch 15, Validation Loss: 2.1297411721930017, Validation Accuracy:
0.9747710173372588
Epoch 16, Validation Loss: 2.131670482623074, Validation Accuracy: 0.9747393212389969
Epoch 17, Validation Loss: 2.1219763552432616, Validation Accuracy:
0.9748646024933578
Epoch 18, Validation Loss: 2.1302377495813016, Validation Accuracy:
0.9747705192202122
Epoch 19, Validation Loss: 2.1300400181236694, Validation Accuracy:
0.9747877487967113
Best parameters for GCN: {'learning_rate': 0.0001, 'hidden_channels': 32, 'dropout_rate': 0.6,
'heads': 1}
Best validation accuracy for GCN: 0.9748429921770645

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.3
Epoch 0, Validation Loss: 1.8174734828489885, Validation Accuracy: 0.1106578002815239
Epoch 1, Validation Loss: 3.673520489011154, Validation Accuracy: 0.03247355392801764
Epoch 2, Validation Loss: 3.9667071112923824, Validation Accuracy:
0.027476372924648787
Epoch 3, Validation Loss: 1.2757778188430937, Validation Accuracy:
0.02659967149546199
Epoch 4, Validation Loss: 1.1722627097264708, Validation Accuracy:
0.02650419549686743
Epoch 5, Validation Loss: 1.067623144639633, Validation Accuracy: 0.02641480516494885
Epoch 6, Validation Loss: 0.8977482734483762, Validation Accuracy:
0.026171083851161698
Epoch 7, Validation Loss: 0.8895349755476485, Validation Accuracy:
0.025303682509675688
Epoch 8, Validation Loss: 0.7942048470968053, Validation Accuracy:
0.02529841712508236
Epoch 9, Validation Loss: 0.7522184198015085, Validation Accuracy:
0.02526775129787843
Epoch 10, Validation Loss: 0.7531700870831018, Validation Accuracy:
0.025189650328216392
Epoch 11, Validation Loss: 0.6190162910421196, Validation Accuracy:
0.9747388428611939

Epoch 12, Validation Loss: 0.5735141861231688, Validation Accuracy: 0.9748404852009618

Epoch 13, Validation Loss: 0.5623538000116277, Validation Accuracy: 0.9747361753859042

Epoch 14, Validation Loss: 0.5458684347699357, Validation Accuracy: 0.9748533002646348

Epoch 15, Validation Loss: 0.5257787913010079, Validation Accuracy: 0.9747366108380425

Epoch 16, Validation Loss: 0.5049849374418519, Validation Accuracy: 0.9747805560948692

Epoch 17, Validation Loss: 0.491115459955064, Validation Accuracy: 0.9747414504317886

Epoch 18, Validation Loss: 0.48120960940794083, Validation Accuracy: 0.9747819734025432

Epoch 19, Validation Loss: 0.47544741327354395, Validation Accuracy: 0.9747362235904249

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 19.00524313330059, Validation Accuracy: 0.7908947168105199

Epoch 1, Validation Loss: 1.5441065870789308, Validation Accuracy: 0.9740545373267769

Epoch 2, Validation Loss: 1.5166377473816681, Validation Accuracy: 0.9708293720162338

Epoch 3, Validation Loss: 1.6288007374289017, Validation Accuracy: 0.9669904847561911

Epoch 4, Validation Loss: 1.1972975855133965, Validation Accuracy: 0.9705281072876046

Epoch 5, Validation Loss: 0.7772954894650367, Validation Accuracy: 0.9728556582841181

Epoch 6, Validation Loss: 0.6306751320143196, Validation Accuracy: 0.9736239205780415

Epoch 7, Validation Loss: 0.5725198334115315, Validation Accuracy: 0.9743158776664359

Epoch 8, Validation Loss: 0.5441806317854756, Validation Accuracy: 0.9742696540258096

Epoch 9, Validation Loss: 0.5437978576341871, Validation Accuracy: 0.9741871070868635

Epoch 10, Validation Loss: 0.5324684879176375, Validation Accuracy: 0.9742496397657711

Epoch 11, Validation Loss: 0.5107787874141343, Validation Accuracy: 0.9741799866161964

Epoch 12, Validation Loss: 0.4920531423304868, Validation Accuracy: 0.9743009453553448

Epoch 13, Validation Loss: 0.5477439125921235, Validation Accuracy: 0.9733915775759666

Epoch 14, Validation Loss: 0.5367424048058153, Validation Accuracy: 0.9733976782685115

Epoch 15, Validation Loss: 0.9683111222003293, Validation Accuracy: 0.9689218704098707

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 1.9948806363390923, Validation Accuracy: 0.9634019881284417

Epoch 1, Validation Loss: 91.41477807283994, Validation Accuracy: 0.08823454286312714

Epoch 2, Validation Loss: 91.59197595752498, Validation Accuracy: 0.09023063711458248

Epoch 3, Validation Loss: 22.230239062465465, Validation Accuracy: 0.7518942875232318

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 96.07381957932087, Validation Accuracy: 0.03724700700537027

Epoch 1, Validation Loss: 2.1262477411525715, Validation Accuracy: 0.9747719665806485

Epoch 2, Validation Loss: 2.125466142598512, Validation Accuracy: 0.9747950468920449

Epoch 3, Validation Loss: 2.1311749364838706, Validation Accuracy: 0.9747227395706392

Epoch 4, Validation Loss: 2.131615999836484, Validation Accuracy: 0.9747097367513508

Epoch 5, Validation Loss: 2.1254664549312876, Validation Accuracy: 0.9747898086569208

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 55.952382516032706, Validation Accuracy: 0.4696741726591138

Epoch 1, Validation Loss: 46.27653661377673, Validation Accuracy: 0.5626125585304358

Epoch 2, Validation Loss: 33.76509961064341, Validation Accuracy: 0.6766724411943563

Epoch 3, Validation Loss: 5.992484207878141, Validation Accuracy: 0.8801648563639105

Epoch 4, Validation Loss: 12.11417456707055, Validation Accuracy: 0.8247776265351622

Epoch 5, Validation Loss: 4.466568590920631, Validation Accuracy: 0.781771209980145

Epoch 6, Validation Loss: 4.325544878618593, Validation Accuracy: 0.6929172883157227

Epoch 7, Validation Loss: 4.19344020581275, Validation Accuracy: 0.6349422960941253

Epoch 8, Validation Loss: 2.401161642121174, Validation Accuracy: 0.8310707242052341

Epoch 9, Validation Loss: 2.700652399483985, Validation Accuracy: 0.7172662532056849

Epoch 10, Validation Loss: 2.776223037743169, Validation Accuracy: 0.6848858417161804

Epoch 11, Validation Loss: 2.8608508891155644, Validation Accuracy: 0.5919162648308712

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 4.377153133580614, Validation Accuracy: 0.7871437730364573

Epoch 1, Validation Loss: 11.66192878412069, Validation Accuracy: 0.48412791647938547

Epoch 2, Validation Loss: 60.835366629785106, Validation Accuracy: 0.11967759653582331

Epoch 3, Validation Loss: 2.2049606069182937, Validation Accuracy: 0.5632789967530891

Epoch 4, Validation Loss: 2.0905278257785307, Validation Accuracy: 0.49393278289836706

Epoch 5, Validation Loss: 1.8174075500914832, Validation Accuracy: 0.39855986840088686

Epoch 6, Validation Loss: 1.457408036620682, Validation Accuracy: 0.28456906660262976

Epoch 7, Validation Loss: 1.2381627885047022, Validation Accuracy: 0.2127142112631439

Epoch 8, Validation Loss: 0.8854872992553426, Validation Accuracy: 0.08761928114591634

Epoch 9, Validation Loss: 0.9686431427747381, Validation Accuracy: 0.9708290019130617

Epoch 10, Validation Loss: 1.0482926503304513, Validation Accuracy: 0.9700921009915618

Epoch 11, Validation Loss: 0.6413174163614845, Validation Accuracy: 0.9747003314177372

Epoch 12, Validation Loss: 1.8713057498186456, Validation Accuracy: 0.9626486739015555

Epoch 13, Validation Loss: 0.723434013335344, Validation Accuracy: 0.9734293284007266

Epoch 14, Validation Loss: 1.9273678448892408, Validation Accuracy: 0.9608033400150658

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 2.0998484463460985, Validation Accuracy: 0.9747527409338342

Epoch 1, Validation Loss: 2.0973213799390247, Validation Accuracy: 0.9747523007036244

Epoch 2, Validation Loss: 97.73116921550287, Validation Accuracy: 0.02526492782361825

Epoch 3, Validation Loss: 97.68161012635338, Validation Accuracy: 0.025269909412651566

Epoch 4, Validation Loss: 97.70107727429411, Validation Accuracy: 0.025226146062247663

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.6424814228976, Validation Accuracy: 0.0253276782748665

Epoch 1, Validation Loss: 97.2611813983018, Validation Accuracy: 0.029124403722203495

Epoch 2, Validation Loss: 2.2732016361380927, Validation Accuracy: 0.9726301104555942

Epoch 3, Validation Loss: 2.79892444566225, Validation Accuracy: 0.9666184875151305

Epoch 4, Validation Loss: 3.3648692646038443, Validation Accuracy: 0.9614686163080263

Epoch 5, Validation Loss: 2.1000284962263653, Validation Accuracy: 0.9747336890960764

Epoch 6, Validation Loss: 2.0934628545128677, Validation Accuracy: 0.9747511904032043

Epoch 7, Validation Loss: 2.085255880879409, Validation Accuracy: 0.9747019133242891

Epoch 8, Validation Loss: 2.0649069573536107, Validation Accuracy: 0.9748191693290735

Epoch 9, Validation Loss: 2.053637351609637, Validation Accuracy: 0.9747268998245314

Epoch 10, Validation Loss: 2.0740799561937897, Validation Accuracy: 0.9740774330348589

Epoch 11, Validation Loss: 2.10333142791951, Validation Accuracy: 0.9740371591402796

Epoch 12, Validation Loss: 44.31201762774446, Validation Accuracy: 0.555143743853689

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.47481054111982, Validation Accuracy: 0.02647532394510185

Epoch 1, Validation Loss: 97.59556443283043, Validation Accuracy: 0.025242758130896513

Epoch 2, Validation Loss: 97.65519350870667, Validation Accuracy: 0.02522027838079428

Epoch 3, Validation Loss: 2.094790237713097, Validation Accuracy: 0.9746887807867621

Epoch 4, Validation Loss: 66.00980825873818, Validation Accuracy: 0.349337959863657

Epoch 5, Validation Loss: 2.116707043893284, Validation Accuracy: 0.9748039340911994

Epoch 6, Validation Loss: 2.1221166673132563, Validation Accuracy: 0.9747422891061596

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 39.39307693482628, Validation Accuracy: 0.6033024916850167
Epoch 1, Validation Loss: 0.8309834467861847, Validation Accuracy: 0.06598406409106818
Epoch 2, Validation Loss: 0.8332548366291056, Validation Accuracy: 0.05596571524950743
Epoch 3, Validation Loss: 0.8878970084060215, Validation Accuracy: 0.0539581023993298
Epoch 4, Validation Loss: 0.878182294498898, Validation Accuracy: 0.05229796812046672
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 39.19234840982309, Validation Accuracy: 0.5872608016019779
Epoch 1, Validation Loss: 26.451297011328098, Validation Accuracy: 0.7062824189828708
Epoch 2, Validation Loss: 1.0141277362779708, Validation Accuracy: 0.16184885455622994
Epoch 3, Validation Loss: 4.1548421706070675, Validation Accuracy: 0.9386734600014309
Epoch 4, Validation Loss: 5.997822752809406, Validation Accuracy: 0.9229474318790823
Epoch 5, Validation Loss: 2.4531398702496037, Validation Accuracy: 0.025299219538365246
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 47.57505232997923, Validation Accuracy: 0.5157122022114321
Epoch 1, Validation Loss: 0.7566959532555516, Validation Accuracy: 0.025210212818128876
Epoch 2, Validation Loss: 0.7306224986282235, Validation Accuracy: 0.025194987069009578
Epoch 3, Validation Loss: 0.6541272833684538, Validation Accuracy: 0.9746099787203062
Epoch 4, Validation Loss: 0.7014612413517595, Validation Accuracy: 0.025303713544793757
Epoch 5, Validation Loss: 0.7059663368513803, Validation Accuracy: 0.025248797828302045
Epoch 6, Validation Loss: 0.7372946391626268, Validation Accuracy: 0.02520126006300315
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 97.66496002348718, Validation Accuracy: 0.02534121522413595

Epoch 1, Validation Loss: 38.9582436695584, Validation Accuracy: 0.13033736571158488

Epoch 2, Validation Loss: 1.9423415178696513, Validation Accuracy:
0.11747877351261328

Epoch 3, Validation Loss: 0.907165751563704, Validation Accuracy: 0.06126354952956749

Epoch 4, Validation Loss: 2.282320598366834, Validation Accuracy: 0.04171616756981863

Epoch 5, Validation Loss: 0.8643738869993621, Validation Accuracy:
0.03711592437371826

Epoch 6, Validation Loss: 1.0482709330897177, Validation Accuracy: 0.0374421152917798

Epoch 7, Validation Loss: 1.0052667149243224, Validation Accuracy:
0.03230659977316153

Epoch 8, Validation Loss: 1.0834559175571792, Validation Accuracy:
0.036534230719109564

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 97.83926749406913, Validation Accuracy:
0.025246487867177522

Epoch 1, Validation Loss: 40.119327410057224, Validation Accuracy:
0.40505711416957707

Epoch 2, Validation Loss: 2.3900404178696886, Validation Accuracy: 0.8558962673832855

Epoch 3, Validation Loss: 16.29550026249945, Validation Accuracy: 0.821779319051282

Epoch 4, Validation Loss: 3.292132556438446, Validation Accuracy: 0.9490865222414199

Epoch 5, Validation Loss: 0.8502373724954004, Validation Accuracy: 0.0539158334653172

Epoch 6, Validation Loss: 1.4638637475872749, Validation Accuracy: 0.9660780562317522

Epoch 7, Validation Loss: 1.7855764966153034, Validation Accuracy: 0.9611928021090924

Epoch 8, Validation Loss: 2.1150705338116023, Validation Accuracy:
0.03271189168065102

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.83918862543982, Validation Accuracy: 0.02527382962904293

Epoch 1, Validation Loss: 2.14938377424446, Validation Accuracy: 0.97452502663223

Epoch 2, Validation Loss: 2.1396479075659003, Validation Accuracy: 0.9746361725118338

Epoch 3, Validation Loss: 2.1205372826633027, Validation Accuracy: 0.9748597001657798
Epoch 4, Validation Loss: 2.127496674398039, Validation Accuracy: 0.9747617064652849
Epoch 5, Validation Loss: 2.1338903367075672, Validation Accuracy: 0.97467572260239
Epoch 6, Validation Loss: 2.1307749571856434, Validation Accuracy: 0.9747389073964315
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.8672387097077, Validation Accuracy: 0.025145744664544577
Epoch 1, Validation Loss: 97.86162222585371, Validation Accuracy: 0.025301029363297027
Epoch 2, Validation Loss: 30.90617593878848, Validation Accuracy: 0.6572742133224356
Epoch 3, Validation Loss: 97.69521803181462, Validation Accuracy: 0.02729314260750044
Epoch 4, Validation Loss: 33.117197036743164, Validation Accuracy: 0.6327176969700066
Epoch 5, Validation Loss: 33.64589341106841, Validation Accuracy: 0.6324271844660194
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.44098750414979, Validation Accuracy: 0.027915474243663124
Epoch 1, Validation Loss: 97.82301251054106, Validation Accuracy: 0.025208925032181608
Epoch 2, Validation Loss: 2.277255075741051, Validation Accuracy: 0.9729055986922762
Epoch 3, Validation Loss: 2.168691498987728, Validation Accuracy: 0.9742682739949942
Epoch 4, Validation Loss: 2.1200796341703785, Validation Accuracy: 0.9748742050011494
Epoch 5, Validation Loss: 2.130199614514784, Validation Accuracy: 0.9747342395496503
Epoch 6, Validation Loss: 2.131918845194445, Validation Accuracy: 0.974698865943315
Epoch 7, Validation Loss: 2.1293410999011755, Validation Accuracy: 0.9747427143919017
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.81454471559738, Validation Accuracy: 0.025141056062281775
Epoch 1, Validation Loss: 97.81239161716205, Validation Accuracy: 0.025504130626925456

Epoch 2, Validation Loss: 84.14570087593779, Validation Accuracy: 0.1758430639410749
Epoch 3, Validation Loss: 2.116764880439484, Validation Accuracy: 0.974835327122862
Epoch 4, Validation Loss: 2.120498938167066, Validation Accuracy: 0.97478182472934
Epoch 5, Validation Loss: 2.1215218696419713, Validation Accuracy: 0.9747690719964033
Epoch 6, Validation Loss: 97.8344248163493, Validation Accuracy: 0.025375937448096995
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 95.8924077793623, Validation Accuracy: 0.04579170315823339
Epoch 1, Validation Loss: 20.41647309819167, Validation Accuracy: 0.12086219185991554
Epoch 2, Validation Loss: 26.415413981927536, Validation Accuracy:
0.08256280675218894
Epoch 3, Validation Loss: 25.54112922760748, Validation Accuracy: 0.09194274530244728
Epoch 4, Validation Loss: 24.861244723459627, Validation Accuracy:
0.08914543517636209
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 97.8600609450423, Validation Accuracy: 0.025300644713046497
Epoch 1, Validation Loss: 2.230416273459711, Validation Accuracy: 0.973458245725191
Epoch 2, Validation Loss: 2.050963873542827, Validation Accuracy: 0.39301122648377335
Epoch 3, Validation Loss: 2.4189469059998583, Validation Accuracy:
0.30473495200682477
Epoch 4, Validation Loss: 54.56350765580649, Validation Accuracy: 0.4371195070420736
Epoch 5, Validation Loss: 39.345971713290915, Validation Accuracy: 0.1811183755017156
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 97.84896960388637, Validation Accuracy:
0.025232990659935825
Epoch 1, Validation Loss: 42.082847737644805, Validation Accuracy:
0.025200724472930616
Epoch 2, Validation Loss: 13.2002103464775, Validation Accuracy: 0.025195506605453492
Epoch 3, Validation Loss: 64.43392892274312, Validation Accuracy: 0.38238471932383317

Epoch 4, Validation Loss: 74.4950880850515, Validation Accuracy: 0.27249287035806646

Epoch 5, Validation Loss: 64.33671539533819, Validation Accuracy: 0.3884625210771039

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 97.10134978566514, Validation Accuracy: 0.03338585250879079

Epoch 1, Validation Loss: 6.7207419353146705, Validation Accuracy:
0.43905429429674886

Epoch 2, Validation Loss: 4.210978846100365, Validation Accuracy: 0.18209788208357183

Epoch 3, Validation Loss: 16.351907508249024, Validation Accuracy: 0.031282575370465

Epoch 4, Validation Loss: 15.98399329126325, Validation Accuracy: 0.06338598467720716

Epoch 5, Validation Loss: 4.654715972857795, Validation Accuracy: 0.04085220782340479

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 97.85869655183173, Validation Accuracy: 0.02528330331020914

Epoch 1, Validation Loss: 90.61773370217449, Validation Accuracy: 0.07682914991340244

Epoch 2, Validation Loss: 6.804144594568768, Validation Accuracy: 0.09678565222280147

Epoch 3, Validation Loss: 3.3239530523125054, Validation Accuracy:
0.07692641632298676

Epoch 4, Validation Loss: 4.0840111624810005, Validation Accuracy:
0.057979455816721974

Epoch 5, Validation Loss: 4.1017390758760515, Validation Accuracy:
0.05622495089161415

Epoch 6, Validation Loss: 4.195196665250338, Validation Accuracy:
0.037368375339120304

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 97.86309208645123, Validation Accuracy:
0.025254060238902185

Epoch 1, Validation Loss: 63.32697246920678, Validation Accuracy: 0.32754575796451807

Epoch 2, Validation Loss: 2.654145709791269, Validation Accuracy: 0.9108377404767379

Epoch 3, Validation Loss: 6.024725481904766, Validation Accuracy: 0.9160720535675508

Epoch 4, Validation Loss: 4.240193860036859, Validation Accuracy: 0.7295354929397483
Epoch 5, Validation Loss: 53.533458378415546, Validation Accuracy: 0.4931225421680282
Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 97.86302249425694, Validation Accuracy: 0.025250899354100236

Epoch 1, Validation Loss: 97.87422846564584, Validation Accuracy: 0.025181537455589414

Epoch 2, Validation Loss: 97.86879516298659, Validation Accuracy: 0.025248977652675218

Epoch 3, Validation Loss: 97.86876752299648, Validation Accuracy: 0.025228507984044687

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 97.86290489177846, Validation Accuracy: 0.025236117708955872

Epoch 1, Validation Loss: 2.1331849277167403, Validation Accuracy: 0.9747071570210765

Epoch 2, Validation Loss: 3.5509645524746727, Validation Accuracy: 0.9578525170207058

Epoch 3, Validation Loss: 54.42873201772534, Validation Accuracy: 0.47736024059136006

Epoch 4, Validation Loss: 29.81112738179214, Validation Accuracy: 0.6767983245859353

Early stopping due to no improvement.

Tuning GAT with SMOTE and lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 97.86974664124898, Validation Accuracy: 0.02518185904902021

Epoch 1, Validation Loss: 4.460549935291778, Validation Accuracy: 0.9465909613116361

Epoch 2, Validation Loss: 2.143552017160148, Validation Accuracy: 0.9745544084065981

Epoch 3, Validation Loss: 2.1204105333492125, Validation Accuracy: 0.9748532467167387

Epoch 4, Validation Loss: 2.1271196437384887, Validation Accuracy: 0.9747728869865202

Epoch 5, Validation Loss: 2.1320647166177595, Validation Accuracy: 0.9747181178731026

Epoch 6, Validation Loss: 2.1321057664697283, Validation Accuracy: 0.9747315563093207

Early stopping due to no improvement.

Best parameters for GAT: {'learning_rate': 0.0001, 'hidden_channels': 32, 'dropout_rate': 0.3, 'heads': 8}

Best validation accuracy for GAT: 0.9747898086569208

Evaluating GIN model with SMOTE and the best hyperparameters...

Test Loss: 14.01820130520974, Test Accuracy: 0.8109274325095832

Precision: 0.0213, F1 Score: 0.0373, Recall: 0.1486

Evaluating GCN model with SMOTE and the best hyperparameters...

Test Loss: 44.33119998115555, Test Accuracy: 0.5265838864203325

Precision: 0.0266, F1 Score: 0.0505, Recall: 0.5111

Evaluating GAT model with SMOTE and the best hyperparameters...

Test Loss: 63.673060179348326, Test Accuracy: 0.3084712060570525

Precision: 0.0246, F1 Score: 0.0475, Recall: 0.7009

Focal Loss

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34935997888704684, Validation Accuracy: 0.02547411149798963

Epoch 1, Validation Loss: 0.349365828794522, Validation Accuracy: 0.025470028471028805

Epoch 2, Validation Loss: 0.3493684997629587, Validation Accuracy: 0.02543138170418221

Epoch 3, Validation Loss: 0.34936535388009426, Validation Accuracy: 0.02543833550491941

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3537443814147495, Validation Accuracy: 0.6135799302277858

Epoch 1, Validation Loss: 0.3537064173972932, Validation Accuracy: 0.6115038914746573

Epoch 2, Validation Loss: 0.35364883834907496, Validation Accuracy: 0.6085947258937022

Epoch 3, Validation Loss: 0.35365986328562793, Validation Accuracy: 0.6081083854022387

Epoch 4, Validation Loss: 0.3536846327870419, Validation Accuracy: 0.6095213172626469

Epoch 5, Validation Loss: 0.35360937156984884, Validation Accuracy: 0.60629989943148

Epoch 6, Validation Loss: 0.353583116907044, Validation Accuracy: 0.6033217716115261

Epoch 7, Validation Loss: 0.3535292180389092, Validation Accuracy: 0.6017801718609722

Epoch 8, Validation Loss: 0.3535430077139852, Validation Accuracy: 0.6072145008285748

Epoch 9, Validation Loss: 0.35353335612465075, Validation Accuracy: 0.6069502465744994

Epoch 10, Validation Loss: 0.35351712288099246, Validation Accuracy: 0.6042672880599084

Epoch 11, Validation Loss: 0.35341933739392395, Validation Accuracy: 0.5916006835220887

Epoch 12, Validation Loss: 0.3534486197656201, Validation Accuracy: 0.5931704890457045

Epoch 13, Validation Loss: 0.3534555058029686, Validation Accuracy: 0.5930690402595904

Epoch 14, Validation Loss: 0.35332824641066807, Validation Accuracy: 0.5834026067323481

Epoch 15, Validation Loss: 0.35333649736480144, Validation Accuracy: 0.57771944949044

Epoch 16, Validation Loss: 0.3532843666691934, Validation Accuracy: 0.5754490526553347

Epoch 17, Validation Loss: 0.35329336349484936, Validation Accuracy: 0.5741426142090967

Epoch 18, Validation Loss: 0.35326400517529943, Validation Accuracy: 0.5620661426375448

Epoch 19, Validation Loss: 0.3531244181225968, Validation Accuracy: 0.5471449382412081

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3513453840913607, Validation Accuracy: 0.23877354740257242

Epoch 1, Validation Loss: 0.35133809176627223, Validation Accuracy: 0.2372665741640784

Epoch 2, Validation Loss: 0.351291482265179, Validation Accuracy: 0.23766078871433152

Epoch 3, Validation Loss: 0.3510854305611651, Validation Accuracy:
0.22346456127390626

Epoch 4, Validation Loss: 0.3509968828326715, Validation Accuracy:
0.22073666071758263

Epoch 5, Validation Loss: 0.35100142890702996, Validation Accuracy:
0.22043678066594177

Epoch 6, Validation Loss: 0.3509576779145461, Validation Accuracy:
0.22014621008080032

Epoch 7, Validation Loss: 0.3509183173292032, Validation Accuracy: 0.2175274869042794

Epoch 8, Validation Loss: 0.3508201026295314, Validation Accuracy: 0.2152972687297002

Epoch 9, Validation Loss: 0.35087726718142964, Validation Accuracy:
0.2151554802955665

Epoch 10, Validation Loss: 0.3509262163497082, Validation Accuracy:
0.21617559939784528

Epoch 11, Validation Loss: 0.35087430521513036, Validation Accuracy:
0.2152785616796823

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3502059383664474, Validation Accuracy: 0.0437746460082767

Epoch 1, Validation Loss: 0.3509774951278128, Validation Accuracy:
0.08174505045737417

Epoch 2, Validation Loss: 0.3507031670427204, Validation Accuracy:
0.05694687779764363

Epoch 3, Validation Loss: 0.35055647439163906, Validation Accuracy:
0.052447597284522446

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3513415023203819, Validation Accuracy:
0.08813169729324813

Epoch 1, Validation Loss: 0.35127665764344834, Validation Accuracy: 0.080062923262874

Epoch 2, Validation Loss: 0.3512540079523849, Validation Accuracy:
0.07842473308604352

Epoch 3, Validation Loss: 0.3511779113827509, Validation Accuracy:
0.07229580149244925

Epoch 4, Validation Loss: 0.3511407654871124, Validation Accuracy: 0.07064994357238125

Epoch 5, Validation Loss: 0.35116374411298973, Validation Accuracy: 0.071272469835016

Epoch 6, Validation Loss: 0.3511466364706716, Validation Accuracy: 0.06719756988629366

Epoch 7, Validation Loss: 0.3510495753353346, Validation Accuracy: 0.06369397348734507

Epoch 8, Validation Loss: 0.35101051247741094, Validation Accuracy: 0.060124187918223715

Epoch 9, Validation Loss: 0.35119827650025226, Validation Accuracy: 0.07743245289604919

Epoch 10, Validation Loss: 0.35059267770563696, Validation Accuracy: 0.04483980469180973

Epoch 11, Validation Loss: 0.35056626072000924, Validation Accuracy: 0.043452500038473965

Epoch 12, Validation Loss: 0.35054326759970217, Validation Accuracy: 0.04238057618910822

Epoch 13, Validation Loss: 0.35049817624222257, Validation Accuracy: 0.04035010289596987

Epoch 14, Validation Loss: 0.35047795126219244, Validation Accuracy: 0.04001601564605422

Epoch 15, Validation Loss: 0.35045593806886793, Validation Accuracy: 0.03921216674658509

Epoch 16, Validation Loss: 0.35035261511802673, Validation Accuracy: 0.03610298134957177

Epoch 17, Validation Loss: 0.35030830165292726, Validation Accuracy: 0.03515587911509829

Epoch 18, Validation Loss: 0.35032574747395573, Validation Accuracy: 0.0352501115996983

Epoch 19, Validation Loss: 0.35017835568849265, Validation Accuracy: 0.03044566131380873

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3551341429093931, Validation Accuracy: 0.8520767437028144

Epoch 1, Validation Loss: 0.35510887490312754, Validation Accuracy: 0.8517335590872359

Epoch 2, Validation Loss: 0.3549984976020699, Validation Accuracy: 0.8469325452409172

Epoch 3, Validation Loss: 0.3550713349956437, Validation Accuracy: 0.8470769885788006

Epoch 4, Validation Loss: 0.35501847639864786, Validation Accuracy: 0.8445591603004495

Epoch 5, Validation Loss: 0.3549539395064929, Validation Accuracy: 0.8437059116257356

Epoch 6, Validation Loss: 0.35492690835638024, Validation Accuracy: 0.8467226295905884

Epoch 7, Validation Loss: 0.3548386274437159, Validation Accuracy: 0.8123504228560289

Epoch 8, Validation Loss: 0.35457977231028065, Validation Accuracy: 0.7833890212349124

Epoch 9, Validation Loss: 0.35451584862124536, Validation Accuracy: 0.7806786904337432

Epoch 10, Validation Loss: 0.35452558843432824, Validation Accuracy: 0.7756274460522063

Epoch 11, Validation Loss: 0.35452997344303366, Validation Accuracy: 0.7739242148775165

Epoch 12, Validation Loss: 0.3544244818740684, Validation Accuracy: 0.7707349239623237

Epoch 13, Validation Loss: 0.35439943749614744, Validation Accuracy: 0.7676852647371863

Epoch 14, Validation Loss: 0.3542965891639293, Validation Accuracy: 0.7609219814495609

Epoch 15, Validation Loss: 0.35425214961208124, Validation Accuracy: 0.7574472014322429

Epoch 16, Validation Loss: 0.35426125521991153, Validation Accuracy: 0.7530075525408081

Epoch 17, Validation Loss: 0.35380661494974464, Validation Accuracy: 0.6988115946490971

Epoch 18, Validation Loss: 0.35356795003928854, Validation Accuracy: 0.6812236930866522

Epoch 19, Validation Loss: 0.35351151568126443, Validation Accuracy: 0.6779124744879644

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3539295765217717, Validation Accuracy: 0.9747015298598376

Epoch 1, Validation Loss: 0.3539640161742643, Validation Accuracy: 0.9067074093744147

Epoch 2, Validation Loss: 0.35398404229959246, Validation Accuracy: 0.9012990811002171

Epoch 3, Validation Loss: 0.3540446749396123, Validation Accuracy: 0.8946235510834484

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3523001934843087, Validation Accuracy: 0.3935513330614109

Epoch 1, Validation Loss: 0.3523073878980452, Validation Accuracy: 0.3969297064368435

Epoch 2, Validation Loss: 0.3519227521738994, Validation Accuracy: 0.34888040555795

Epoch 3, Validation Loss: 0.35190108403674425, Validation Accuracy:
0.3372790472844581

Epoch 4, Validation Loss: 0.351265230116714, Validation Accuracy: 0.27955014211979107

Epoch 5, Validation Loss: 0.35116025591014927, Validation Accuracy:
0.2701728459677399

Epoch 6, Validation Loss: 0.35114867345570927, Validation Accuracy:
0.2721062433623551

Epoch 7, Validation Loss: 0.35090712200914953, Validation Accuracy:
0.23868475327580368

Epoch 8, Validation Loss: 0.35092830554427346, Validation Accuracy:
0.23979739693530808

Epoch 9, Validation Loss: 0.3501363509050374, Validation Accuracy:
0.11321761254052279

Epoch 10, Validation Loss: 0.35005910261984796, Validation Accuracy:
0.11038804469388383

Epoch 11, Validation Loss: 0.34995196497174114, Validation Accuracy:
0.104095020069602

Epoch 12, Validation Loss: 0.34993288261127237, Validation Accuracy:
0.10010342429367367

Epoch 13, Validation Loss: 0.34996766761573905, Validation Accuracy:
0.10238984029247643

Epoch 14, Validation Loss: 0.34993038594574843, Validation Accuracy:
0.10146530202771527

Epoch 15, Validation Loss: 0.35002000448721515, Validation Accuracy:
0.10829368387303623

Epoch 16, Validation Loss: 0.3499621215736304, Validation Accuracy:
0.10633985653739982

Epoch 17, Validation Loss: 0.34992341782259884, Validation Accuracy:
0.10371170634818803

Epoch 18, Validation Loss: 0.34992239781408097, Validation Accuracy:
0.104549499757637

Epoch 19, Validation Loss: 0.34992392719827276, Validation Accuracy:
0.10268560374773592

Tuning GIN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3535611209443426, Validation Accuracy: 0.5327979233411225

Epoch 1, Validation Loss: 0.35350904741299066, Validation Accuracy: 0.5239173761039134

Epoch 2, Validation Loss: 0.35344194848247557, Validation Accuracy: 0.5033505392674993

Epoch 3, Validation Loss: 0.35312661144041246, Validation Accuracy: 0.40253949369100944

Epoch 4, Validation Loss: 0.3531108449026018, Validation Accuracy: 0.39460845329233896

Epoch 5, Validation Loss: 0.35268813963267703, Validation Accuracy: 0.338378242514709

Epoch 6, Validation Loss: 0.3527756636550941, Validation Accuracy: 0.3464835553822713

Epoch 7, Validation Loss: 0.35244141641089105, Validation Accuracy: 0.3035762818770608

Epoch 8, Validation Loss: 0.35248271533040787, Validation Accuracy: 0.3026733249719792

Epoch 9, Validation Loss: 0.3524253686367726, Validation Accuracy: 0.28853882672179204

Epoch 10, Validation Loss: 0.3523406590480662, Validation Accuracy: 0.2836852689793866

Epoch 11, Validation Loss: 0.35231454193444167, Validation Accuracy: 0.28045214607796365

Epoch 12, Validation Loss: 0.35223106429831263, Validation Accuracy: 0.27228935441093105

Epoch 13, Validation Loss: 0.35238828804001915, Validation Accuracy: 0.2892722468768438

Epoch 14, Validation Loss: 0.351839640743975, Validation Accuracy: 0.2072586044578749

Epoch 15, Validation Loss: 0.3516651208584125, Validation Accuracy: 0.16804592865461673

Epoch 16, Validation Loss: 0.351374776946108, Validation Accuracy: 0.14285714285714285

Epoch 17, Validation Loss: 0.35124266288120753, Validation Accuracy: 0.12857252769798933

Epoch 18, Validation Loss: 0.3512457999638825, Validation Accuracy: 0.1342313551888462

Epoch 19, Validation Loss: 0.35125605085351624, Validation Accuracy: 0.1323431361486937

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35063019845976723, Validation Accuracy: 0.19553276154459925

Epoch 1, Validation Loss: 0.3503761594703712, Validation Accuracy: 0.15119823472058294

Epoch 2, Validation Loss: 0.3499464988708496, Validation Accuracy: 0.11387764317124106

Epoch 3, Validation Loss: 0.3499077279721537, Validation Accuracy: 0.11144605359364779

Epoch 4, Validation Loss: 0.3497006576646942, Validation Accuracy: 0.08642941448144917

Epoch 5, Validation Loss: 0.3496513130794979, Validation Accuracy: 0.0909899814604451

Epoch 6, Validation Loss: 0.34935265949582933, Validation Accuracy: 0.036436488819456735

Epoch 7, Validation Loss: 0.34934049963063696, Validation Accuracy: 0.03635500833653969

Epoch 8, Validation Loss: 0.3493522467743374, Validation Accuracy: 0.03634022535659231

Epoch 9, Validation Loss: 0.34934999666202154, Validation Accuracy: 0.03642106289464704

Epoch 10, Validation Loss: 0.3493478924553684, Validation Accuracy: 0.036132897659363825

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3594021602688593, Validation Accuracy: 0.6865970386717647

Epoch 1, Validation Loss: 0.35788685527096314, Validation Accuracy: 0.781155818206535

Epoch 2, Validation Loss: 0.35732786080085904, Validation Accuracy: 0.8172096780397738

Epoch 3, Validation Loss: 0.3563928272824725, Validation Accuracy: 0.8667879372540166

Epoch 4, Validation Loss: 0.3541716093904623, Validation Accuracy: 0.9653178003629951

Epoch 5, Validation Loss: 0.35405424806675306, Validation Accuracy: 0.9688243986536409

Epoch 6, Validation Loss: 0.35401931619525845, Validation Accuracy: 0.969758235217147

Epoch 7, Validation Loss: 0.3539887623071079, Validation Accuracy: 0.9704722945332838

Epoch 8, Validation Loss: 0.35397495909896737, Validation Accuracy: 0.9709978316375627

Epoch 9, Validation Loss: 0.3539665121742277, Validation Accuracy: 0.9712328556334054

Epoch 10, Validation Loss: 0.3539617166625655, Validation Accuracy: 0.971406874151763

Epoch 11, Validation Loss: 0.35394445468415103, Validation Accuracy: 0.9717052981406119

Epoch 12, Validation Loss: 0.3539613968237458, Validation Accuracy: 0.9717455560573094

Epoch 13, Validation Loss: 0.3539432432899996, Validation Accuracy: 0.9718874471975932

Epoch 14, Validation Loss: 0.353956457181249, Validation Accuracy: 0.9719975172739257

Epoch 15, Validation Loss: 0.35394158959388733, Validation Accuracy: 0.9722849285831555

Epoch 16, Validation Loss: 0.35394227238506004, Validation Accuracy: 0.9723444858259719

Epoch 17, Validation Loss: 0.3539458707011959, Validation Accuracy: 0.9724569969125989

Epoch 18, Validation Loss: 0.35393742311089565, Validation Accuracy: 0.9725746455187053

Epoch 19, Validation Loss: 0.3539080203466912, Validation Accuracy: 0.9730634891712455

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.36245722051885526, Validation Accuracy: 0.02496889789531737

Epoch 1, Validation Loss: 0.3608506495692298, Validation Accuracy: 0.025020529665366456

Epoch 2, Validation Loss: 0.3598739261514792, Validation Accuracy: 0.024960694344345755

Epoch 3, Validation Loss: 0.35858135387560275, Validation Accuracy: 0.025014364278092425

Epoch 4, Validation Loss: 0.3569423957143173, Validation Accuracy: 0.0249892895715059

Epoch 5, Validation Loss: 0.35605211182504376, Validation Accuracy: 0.0249930731577165

Epoch 6, Validation Loss: 0.35476815656160304, Validation Accuracy: 0.02497294469433916

Epoch 7, Validation Loss: 0.3538542390609202, Validation Accuracy: 0.025004490749056942

Epoch 8, Validation Loss: 0.3532120514448464, Validation Accuracy: 0.025040532775109797

Epoch 9, Validation Loss: 0.35265776581563074, Validation Accuracy: 0.02500698913286021

Epoch 10, Validation Loss: 0.351951503871984, Validation Accuracy: 0.024994229733541918

Epoch 11, Validation Loss: 0.35173197160879377, Validation Accuracy: 0.02506914476013567

Epoch 12, Validation Loss: 0.3514879760759936, Validation Accuracy: 0.025079206269801566

Epoch 13, Validation Loss: 0.35126542150234763, Validation Accuracy: 0.02500051309416304

Epoch 14, Validation Loss: 0.35099980279470494, Validation Accuracy: 0.025025582105093085

Epoch 15, Validation Loss: 0.3508360334128955, Validation Accuracy: 0.025056538751480777

Epoch 16, Validation Loss: 0.350674533962316, Validation Accuracy: 0.02507990580606104

Epoch 17, Validation Loss: 0.35059009503489985, Validation Accuracy: 0.025062001010481824

Epoch 18, Validation Loss: 0.3504958108400293, Validation Accuracy: 0.02505259377084509

Epoch 19, Validation Loss: 0.3504264225291259, Validation Accuracy: 0.02504372714262999

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3544273133904999, Validation Accuracy: 0.8750843400694218

Epoch 1, Validation Loss: 0.3544594568590964, Validation Accuracy: 0.9164522344140035

Epoch 2, Validation Loss: 0.3544050021739515, Validation Accuracy: 0.9499282930671326

Epoch 3, Validation Loss: 0.35435451068002594, Validation Accuracy: 0.959886981024196

Epoch 4, Validation Loss: 0.3544185860429153, Validation Accuracy: 0.9427632658923955

Epoch 5, Validation Loss: 0.3543946627647646, Validation Accuracy: 0.9503152915099615

Epoch 6, Validation Loss: 0.35432634127347107, Validation Accuracy: 0.95713607493424

Epoch 7, Validation Loss: 0.3543200231811249, Validation Accuracy: 0.937092529994409

Epoch 8, Validation Loss: 0.35437470556192896, Validation Accuracy: 0.9302511676100734

Epoch 9, Validation Loss: 0.3543538748478475, Validation Accuracy: 0.9413879770209274

Epoch 10, Validation Loss: 0.35440615070960657, Validation Accuracy: 0.9512673614672876

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.35390586311704764, Validation Accuracy: 0.5898876980930736

Epoch 1, Validation Loss: 0.3538960270934898, Validation Accuracy: 0.5883332221771898

Epoch 2, Validation Loss: 0.3536875421001065, Validation Accuracy: 0.5227473866478548

Epoch 3, Validation Loss: 0.35381656463625416, Validation Accuracy: 0.5633526064940462

Epoch 4, Validation Loss: 0.3536881492392301, Validation Accuracy: 0.5611817808781289

Epoch 5, Validation Loss: 0.3539604532067888, Validation Accuracy: 0.6592258163814996

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3509823352320319, Validation Accuracy: 0.04289500216783952

Epoch 1, Validation Loss: 0.3504086043639455, Validation Accuracy: 0.03781147122443376

Epoch 2, Validation Loss: 0.35016976152696916, Validation Accuracy: 0.03569734436578368

Epoch 3, Validation Loss: 0.3499707813298436, Validation Accuracy: 0.03358996790571309

Epoch 4, Validation Loss: 0.3498906322359743, Validation Accuracy: 0.03316843997548397

Epoch 5, Validation Loss: 0.3498572361824234, Validation Accuracy: 0.033556220396475545

Epoch 6, Validation Loss: 0.34982087897603625, Validation Accuracy: 0.03308674529439226

Epoch 7, Validation Loss: 0.34978741022848314, Validation Accuracy: 0.03349660212847801

Epoch 8, Validation Loss: 0.3497655599495909, Validation Accuracy: 0.03292808043500564

Epoch 9, Validation Loss: 0.3497149062067936, Validation Accuracy: 0.033081125445638515

Epoch 10, Validation Loss: 0.34964388106064526, Validation Accuracy: 0.03175588337881368

Epoch 11, Validation Loss: 0.3495978264151968, Validation Accuracy: 0.031145765982121782

Epoch 12, Validation Loss: 0.3495590981123761, Validation Accuracy: 0.03037313662525264

Epoch 13, Validation Loss: 0.3494953876985214, Validation Accuracy: 0.02783405222154408

Epoch 14, Validation Loss: 0.3494896240920642, Validation Accuracy: 0.030238290036239783

Epoch 15, Validation Loss: 0.3497205400289436, Validation Accuracy: 0.04039652527284202

Epoch 16, Validation Loss: 0.3496373416324407, Validation Accuracy: 0.03951320227240667

Epoch 17, Validation Loss: 0.35049267050350275, Validation Accuracy: 0.09201552316290856

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3541236644051507, Validation Accuracy: 0.9689230911254256

Epoch 1, Validation Loss: 0.3541074598545472, Validation Accuracy: 0.9570033709767624

Epoch 2, Validation Loss: 0.3528652490664357, Validation Accuracy: 0.6768793081775527

Epoch 3, Validation Loss: 0.3540919227872238, Validation Accuracy: 0.9586269005967989

Epoch 4, Validation Loss: 0.35407674660162064, Validation Accuracy: 0.9717534407463349

Epoch 5, Validation Loss: 0.35411006811238993, Validation Accuracy: 0.971480798763245

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3537139726187988, Validation Accuracy: 0.907743332187617

Epoch 1, Validation Loss: 0.35396263321339344, Validation Accuracy: 0.9731947287155732

Epoch 2, Validation Loss: 0.3539571640065527, Validation Accuracy: 0.9731097867451712

Epoch 3, Validation Loss: 0.3539625719818229, Validation Accuracy: 0.9728643190296115

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.35400381255386487, Validation Accuracy: 0.9748787684413085

Epoch 1, Validation Loss: 0.35398749796391715, Validation Accuracy: 0.9749371055472779

Epoch 2, Validation Loss: 0.35398461164966705, Validation Accuracy: 0.9749213646882553

Epoch 3, Validation Loss: 0.35395976664410633, Validation Accuracy: 0.9750017954794956

Epoch 4, Validation Loss: 0.35397395846565666, Validation Accuracy: 0.9749698540164713

Epoch 5, Validation Loss: 0.3539788024892878, Validation Accuracy: 0.974941521667761

Epoch 6, Validation Loss: 0.3539613912034567, Validation Accuracy: 0.974985313395466

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.349410290679624, Validation Accuracy: 0.025379330859594373

Epoch 1, Validation Loss: 0.34940323751262636, Validation Accuracy: 0.025039308276925208

Epoch 2, Validation Loss: 0.349392442194463, Validation Accuracy: 0.025039231976368502

Epoch 3, Validation Loss: 0.349362747544982, Validation Accuracy: 0.02509978350314485

Epoch 4, Validation Loss: 0.3493731395334523, Validation Accuracy: 0.024929916669445207

Epoch 5, Validation Loss: 0.34935169117918086, Validation Accuracy: 0.02503321517792563

Epoch 6, Validation Loss: 0.34933364775873, Validation Accuracy: 0.02504924693232651

Epoch 7, Validation Loss: 0.34933679608198315, Validation Accuracy: 0.025014167429528257

Epoch 8, Validation Loss: 0.34932928020250115, Validation Accuracy: 0.02503758588310149

Epoch 9, Validation Loss: 0.3493248389169537, Validation Accuracy: 0.02507684965180308

Epoch 10, Validation Loss: 0.34933886797197405, Validation Accuracy: 0.024961202529210327

Epoch 11, Validation Loss: 0.34933452925670233, Validation Accuracy: 0.02497010873748544

Epoch 12, Validation Loss: 0.34932973026933506, Validation Accuracy: 0.025013340448239062

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3501806512807794, Validation Accuracy: 0.03799280211986035

Epoch 1, Validation Loss: 0.3496899688362188, Validation Accuracy: 0.027614120495648584

Epoch 2, Validation Loss: 0.3495994273841233, Validation Accuracy: 0.026228700724983452

Epoch 3, Validation Loss: 0.34953373078968625, Validation Accuracy: 0.02601384463020264

Epoch 4, Validation Loss: 0.3494866231534972, Validation Accuracy: 0.02588217185515835

Epoch 5, Validation Loss: 0.3494401472821721, Validation Accuracy: 0.025804349722178044

Epoch 6, Validation Loss: 0.3494110648004944, Validation Accuracy: 0.02577835234005879

Epoch 7, Validation Loss: 0.349408678765924, Validation Accuracy: 0.025594670277256364

Epoch 8, Validation Loss: 0.3493831487506554, Validation Accuracy: 0.025645827454400864

Epoch 9, Validation Loss: 0.349375103084976, Validation Accuracy: 0.025489436682936337

Epoch 10, Validation Loss: 0.3493679868376285, Validation Accuracy: 0.025459797686452484

Epoch 11, Validation Loss: 0.34935531264203357, Validation Accuracy: 0.025485910145106008

Epoch 12, Validation Loss: 0.3493596996474207, Validation Accuracy: 0.025434012411715962

Epoch 13, Validation Loss: 0.3493478568848546, Validation Accuracy: 0.02545908992927603

Epoch 14, Validation Loss: 0.349336105378035, Validation Accuracy: 0.02548982894780715

Epoch 15, Validation Loss: 0.34933223595690194, Validation Accuracy: 0.02547133512889573

Epoch 16, Validation Loss: 0.3493387461004423, Validation Accuracy: 0.025404897774858364

Epoch 17, Validation Loss: 0.3493401780909403, Validation Accuracy: 0.025390539843912298

Epoch 18, Validation Loss: 0.3493396622815144, Validation Accuracy: 0.02538205128205128

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3499809485067505, Validation Accuracy: 0.031749695454254025

Epoch 1, Validation Loss: 0.34970093475973635, Validation Accuracy: 0.026456098417917108

Epoch 2, Validation Loss: 0.3495953732329622, Validation Accuracy: 0.025018144887245235

Epoch 3, Validation Loss: 0.3495182420124783, Validation Accuracy: 0.025054387981282324

Epoch 4, Validation Loss: 0.34948084261222156, Validation Accuracy: 0.024987685740087022

Epoch 5, Validation Loss: 0.3494457955248007, Validation Accuracy: 0.02504514487400476

Epoch 6, Validation Loss: 0.3494333538316911, Validation Accuracy: 0.024991855779318554

Epoch 7, Validation Loss: 0.34940356844412185, Validation Accuracy: 0.02503302933518041

Epoch 8, Validation Loss: 0.34938912940380296, Validation Accuracy: 0.025058980408247

Epoch 9, Validation Loss: 0.3493797234063113, Validation Accuracy: 0.02502821670428894

Epoch 10, Validation Loss: 0.3493665373946538, Validation Accuracy: 0.025053477170249767

Epoch 11, Validation Loss: 0.3493752103881268, Validation Accuracy: 0.024961138500843923

Epoch 12, Validation Loss: 0.3493573532506787, Validation Accuracy: 0.02501519374915056

Epoch 13, Validation Loss: 0.3493582275753873, Validation Accuracy: 0.024976984759936302

Epoch 14, Validation Loss: 0.34935511341757575, Validation Accuracy: 0.024963323176674566

Epoch 15, Validation Loss: 0.3493407635623705, Validation Accuracy: 0.025029048367776703

Epoch 16, Validation Loss: 0.3493355933401188, Validation Accuracy: 0.02503006942253886

Epoch 17, Validation Loss: 0.3493332646916581, Validation Accuracy: 0.025041372144039203

Epoch 18, Validation Loss: 0.34933013470829566, Validation Accuracy: 0.025029042408327287

Epoch 19, Validation Loss: 0.34933424291776366, Validation Accuracy: 0.024984226158415536

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.349392346427695, Validation Accuracy: 0.025033728845729648

Epoch 1, Validation Loss: 0.3493794862449021, Validation Accuracy: 0.0249786392223676

Epoch 2, Validation Loss: 0.3493548170952288, Validation Accuracy: 0.025060226126978995

Epoch 3, Validation Loss: 0.3493600918104868, Validation Accuracy: 0.02497235981745936

Epoch 4, Validation Loss: 0.3493576145941211, Validation Accuracy: 0.024935500582161745

Epoch 5, Validation Loss: 0.3493447910911096, Validation Accuracy: 0.024985187408142692

Epoch 6, Validation Loss: 0.3493382155747331, Validation Accuracy: 0.025010194372706265

Epoch 7, Validation Loss: 0.3493400756685669, Validation Accuracy: 0.024978517653999565

Epoch 8, Validation Loss: 0.34933027662059507, Validation Accuracy: 0.02501744090610637

Epoch 9, Validation Loss: 0.34932659444383, Validation Accuracy: 0.025014494092054158

Epoch 10, Validation Loss: 0.34932229137302334, Validation Accuracy: 0.0250235381343431

Epoch 11, Validation Loss: 0.34931103252891277, Validation Accuracy: 0.02508898987515772

Epoch 12, Validation Loss: 0.34932720143505125, Validation Accuracy: 0.024982428418249818

Epoch 13, Validation Loss: 0.3493298762489489, Validation Accuracy: 0.02495476883990094

Epoch 14, Validation Loss: 0.3493175045875994, Validation Accuracy: 0.025023281349009868

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.35118691464215884, Validation Accuracy: 0.2359277659086071

Epoch 1, Validation Loss: 0.34958343951045434, Validation Accuracy: 0.06114666016952413

Epoch 2, Validation Loss: 0.3494798039680083, Validation Accuracy: 0.05216929561061702

Epoch 3, Validation Loss: 0.3493796354783676, Validation Accuracy: 0.03534051888836745

Epoch 4, Validation Loss: 0.349358460225775, Validation Accuracy: 0.02949307810280005

Epoch 5, Validation Loss: 0.3493576492032697, Validation Accuracy: 0.025222582365732573

Epoch 6, Validation Loss: 0.3495279899601901, Validation Accuracy: 0.06491911078283527

Epoch 7, Validation Loss: 0.3497122558707339, Validation Accuracy: 0.10864122795317198

Epoch 8, Validation Loss: 0.35416220391062886, Validation Accuracy: 0.8925363023558363

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3498235583749066, Validation Accuracy: 0.027221494001369795

Epoch 1, Validation Loss: 0.34968940651150554, Validation Accuracy: 0.026541862368117956

Epoch 2, Validation Loss: 0.34962109818352066, Validation Accuracy: 0.02591429787976258

Epoch 3, Validation Loss: 0.34954495694737875, Validation Accuracy: 0.02583482133694559

Epoch 4, Validation Loss: 0.349501782847989, Validation Accuracy: 0.025735378966020375

Epoch 5, Validation Loss: 0.349458721598088, Validation Accuracy: 0.025692378705508258

Epoch 6, Validation Loss: 0.34943586772783813, Validation Accuracy: 0.025615503215726917

Epoch 7, Validation Loss: 0.3494217309999111, Validation Accuracy: 0.025515256306983473

Epoch 8, Validation Loss: 0.34939623662910746, Validation Accuracy: 0.025561915899834836

Epoch 9, Validation Loss: 0.349392153119331, Validation Accuracy: 0.025482542304200412

Epoch 10, Validation Loss: 0.34935715232534387, Validation Accuracy: 0.02559756282070679

Epoch 11, Validation Loss: 0.34937240793450597, Validation Accuracy: 0.025448660239097372

Epoch 12, Validation Loss: 0.34937130243843306, Validation Accuracy: 0.02540206037509393

Epoch 13, Validation Loss: 0.34936285078081836, Validation Accuracy: 0.025384187210945777

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3538621610802397, Validation Accuracy: 0.9750819520634978

Epoch 1, Validation Loss: 0.35386671026054745, Validation Accuracy: 0.9750424596312811

Epoch 2, Validation Loss: 0.3538917416230621, Validation Accuracy: 0.9749648512463697

Epoch 3, Validation Loss: 0.3538791131292916, Validation Accuracy: 0.9749896163963512

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3494148846003909, Validation Accuracy: 0.025026927219572243

Epoch 1, Validation Loss: 0.3493796343691, Validation Accuracy: 0.025082029035328284

Epoch 2, Validation Loss: 0.34929095855717623, Validation Accuracy: 0.02510991519728303

Epoch 3, Validation Loss: 0.3493125819538722, Validation Accuracy: 0.024977938762108028

Epoch 4, Validation Loss: 0.34929802969430873, Validation Accuracy: 0.025077597927301645

Epoch 5, Validation Loss: 0.34930029659354067, Validation Accuracy: 0.025054569611843977

Early stopping due to no improvement.

Tuning GIN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3538928423123088, Validation Accuracy: 0.9749430874694905

Epoch 1, Validation Loss: 0.35390146516688703, Validation Accuracy:
0.9749014498477827

Epoch 2, Validation Loss: 0.3538896076880377, Validation Accuracy: 0.974944022242342

Epoch 3, Validation Loss: 0.35388214675427665, Validation Accuracy: 0.974950421640537

Epoch 4, Validation Loss: 0.3538998670820563, Validation Accuracy: 0.9748925855147559

Epoch 5, Validation Loss: 0.353904876682362, Validation Accuracy: 0.974873366075965

Epoch 6, Validation Loss: 0.35388950548751774, Validation Accuracy:
0.9749292616791981

Early stopping due to no improvement.

Best parameters for GIN with Focal Loss: {'learning_rate': 0.01, 'hidden_channels': 64,
'dropout_rate': 0.3, 'heads': 1}

Best validation accuracy for GIN: 0.9749896163963512

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.3537277191803414, Validation Accuracy: 0.9336607257340684

Epoch 1, Validation Loss: 0.35369872632748434, Validation Accuracy:
0.9332787797789298

Epoch 2, Validation Loss: 0.35372813005305404, Validation Accuracy:
0.9335128226187298

Epoch 3, Validation Loss: 0.3536963781559142, Validation Accuracy: 0.9328571318611113

Epoch 4, Validation Loss: 0.3536989324294012, Validation Accuracy: 0.9328299447794384

Epoch 5, Validation Loss: 0.35369876093663294, Validation Accuracy:
0.9316470950207681

Epoch 6, Validation Loss: 0.3536860732819247, Validation Accuracy: 0.9317957284762264

Epoch 7, Validation Loss: 0.35370223227860614, Validation Accuracy:
0.9320982905325352

Epoch 8, Validation Loss: 0.3536817855190107, Validation Accuracy: 0.9317337588375935

Epoch 9, Validation Loss: 0.3537235761398713, Validation Accuracy: 0.9316140479529854

Epoch 10, Validation Loss: 0.3537194775440557, Validation Accuracy:
0.9320179657460632

Epoch 11, Validation Loss: 0.3537166682129758, Validation Accuracy:
0.9314216701881064

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3545651507584688, Validation Accuracy: 0.8897468578418676

Epoch 1, Validation Loss: 0.3545747755774789, Validation Accuracy: 0.8894107567482986

Epoch 2, Validation Loss: 0.35458044045912124, Validation Accuracy:
0.8896448611552784

Epoch 3, Validation Loss: 0.3545740122534797, Validation Accuracy: 0.8900651820917269

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3508684219556766, Validation Accuracy: 0.3860738065681074

Epoch 1, Validation Loss: 0.3508909299562942, Validation Accuracy:
0.38384291681946053

Epoch 2, Validation Loss: 0.3508365994351673, Validation Accuracy: 0.3823747457205376

Epoch 3, Validation Loss: 0.35094374869360817, Validation Accuracy:
0.3837305037665146

Epoch 4, Validation Loss: 0.35085175380517475, Validation Accuracy:
0.3828392575394128

Epoch 5, Validation Loss: 0.35090396828746084, Validation Accuracy:
0.3841742119167928

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3493433196846368, Validation Accuracy:
0.037874648916932784

Epoch 1, Validation Loss: 0.3493493906321656, Validation Accuracy:
0.03798010578101995

Epoch 2, Validation Loss: 0.3493472406497368, Validation Accuracy:
0.038011320774082306

Epoch 3, Validation Loss: 0.3493489679272654, Validation Accuracy:
0.03781648410845753

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.35138980101415007, Validation Accuracy: 0.5210991570598165

Epoch 1, Validation Loss: 0.3513732414979201, Validation Accuracy: 0.5213915675010259

Epoch 2, Validation Loss: 0.35143564304997843, Validation Accuracy: 0.5215421595261366

Epoch 3, Validation Loss: 0.35147404581973923, Validation Accuracy: 0.5234896574718835

Epoch 4, Validation Loss: 0.35139667640252975, Validation Accuracy: 0.5216032995529291

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3496792183324658, Validation Accuracy: 0.12153178523613868

Epoch 1, Validation Loss: 0.34969401818055373, Validation Accuracy: 0.12145922416512976

Epoch 2, Validation Loss: 0.3497025137651647, Validation Accuracy: 0.12114362827975997

Epoch 3, Validation Loss: 0.34966290699636965, Validation Accuracy: 0.12066223398797431

Epoch 4, Validation Loss: 0.34966361086362646, Validation Accuracy: 0.10916693388058744

Epoch 5, Validation Loss: 0.34963069098167326, Validation Accuracy: 0.10927750410509031

Epoch 6, Validation Loss: 0.34958525959670395, Validation Accuracy: 0.1060644929581078

Epoch 7, Validation Loss: 0.3495842167372739, Validation Accuracy: 0.10544518764255677

Epoch 8, Validation Loss: 0.3496030085435872, Validation Accuracy: 0.1051363562890153

Epoch 9, Validation Loss: 0.3496203971264084, Validation Accuracy: 0.10434311841392918

Epoch 10, Validation Loss: 0.34964223705213654, Validation Accuracy: 0.10451379535921806

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3493383162222784, Validation Accuracy: 0.028355683187610572

Epoch 1, Validation Loss: 0.3493289662797753, Validation Accuracy: 0.02870423098825666

Epoch 2, Validation Loss: 0.3493394266730798, Validation Accuracy: 0.02860278412398044

Epoch 3, Validation Loss: 0.34932519994657624, Validation Accuracy: 0.02894331133234658

Epoch 4, Validation Loss: 0.3493314077777247, Validation Accuracy: 0.02890738199956403

Epoch 5, Validation Loss: 0.349336684785469, Validation Accuracy: 0.028815915701775538

Epoch 6, Validation Loss: 0.3493314099962599, Validation Accuracy: 0.028721055182689914

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.354026005966196, Validation Accuracy: 0.7434774133314181

Epoch 1, Validation Loss: 0.354054095135729, Validation Accuracy: 0.7478255515017165

Epoch 2, Validation Loss: 0.3540269069872778, Validation Accuracy: 0.7439906435628327

Epoch 3, Validation Loss: 0.3539771851032011, Validation Accuracy: 0.7272438166169124

Epoch 4, Validation Loss: 0.35377930285912884, Validation Accuracy: 0.6666846202182639

Epoch 5, Validation Loss: 0.35376955224917483, Validation Accuracy: 0.6651829351203106

Epoch 6, Validation Loss: 0.35370319852462184, Validation Accuracy: 0.6525934799393602

Epoch 7, Validation Loss: 0.35364065535606876, Validation Accuracy: 0.6419495601714678

Epoch 8, Validation Loss: 0.3535986678032366, Validation Accuracy: 0.6295874413461711

Epoch 9, Validation Loss: 0.3535137078158613, Validation Accuracy: 0.6172059781744301

Epoch 10, Validation Loss: 0.353535933692757, Validation Accuracy: 0.6250250173196829

Epoch 11, Validation Loss: 0.35344517926128566, Validation Accuracy: 0.6015502523457765

Epoch 12, Validation Loss: 0.35360156387904146, Validation Accuracy: 0.6298551252426762

Epoch 13, Validation Loss: 0.3535641101246732, Validation Accuracy: 0.6222509104815094

Epoch 14, Validation Loss: 0.35357420712191767, Validation Accuracy: 0.6226199728619835

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3531905112432191, Validation Accuracy: 0.6410228777288542

Epoch 1, Validation Loss: 0.3530160818738914, Validation Accuracy: 0.612408111338535

Epoch 2, Validation Loss: 0.3530489110177563, Validation Accuracy: 0.6174286139279138

Epoch 3, Validation Loss: 0.3530359035981796, Validation Accuracy: 0.616867525511382

Epoch 4, Validation Loss: 0.35301765466742124, Validation Accuracy: 0.6146768989273568

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35248032567223014, Validation Accuracy: 0.6964525255012401

Epoch 1, Validation Loss: 0.3524539747989503, Validation Accuracy: 0.696245051180537

Epoch 2, Validation Loss: 0.35244330660285195, Validation Accuracy: 0.6981481956449255

Epoch 3, Validation Loss: 0.35243446825455793, Validation Accuracy: 0.6939900244257887

Epoch 4, Validation Loss: 0.35241223660947074, Validation Accuracy: 0.6930266548713412

Epoch 5, Validation Loss: 0.3523879542983791, Validation Accuracy: 0.6941455594741904

Epoch 6, Validation Loss: 0.35237934468106064, Validation Accuracy: 0.6958819213937955

Epoch 7, Validation Loss: 0.35238066729777506, Validation Accuracy: 0.6947780143117289

Epoch 8, Validation Loss: 0.35242829540231385, Validation Accuracy: 0.6964895492060886

Epoch 9, Validation Loss: 0.3523657145926142, Validation Accuracy: 0.6976314040979044

Epoch 10, Validation Loss: 0.3523905732791418, Validation Accuracy: 0.7000192403894255

Epoch 11, Validation Loss: 0.35238195160778224, Validation Accuracy: 0.6983425159166202

Epoch 12, Validation Loss: 0.352451989062075, Validation Accuracy: 0.7003429884892345

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.35361961277187903, Validation Accuracy: 0.9204811114732306

Epoch 1, Validation Loss: 0.35364770985418753, Validation Accuracy: 0.9197945172103378

Epoch 2, Validation Loss: 0.3536681313224821, Validation Accuracy: 0.9201281972328283

Epoch 3, Validation Loss: 0.3536216377768268, Validation Accuracy: 0.9200621693087768

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3522023981617343, Validation Accuracy: 0.2726640776101332

Epoch 1, Validation Loss: 0.3522951179195574, Validation Accuracy: 0.290357479798187

Epoch 2, Validation Loss: 0.35243673522774105, Validation Accuracy: 0.31624111365291696

Epoch 3, Validation Loss: 0.3523641779612075, Validation Accuracy: 0.3117722194293687

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3491665316426724, Validation Accuracy: 0.2039391327546225

Epoch 1, Validation Loss: 0.34907822455129317, Validation Accuracy: 0.149050621546607

Epoch 2, Validation Loss: 0.3492505270109579, Validation Accuracy: 0.06519017221207332

Epoch 3, Validation Loss: 0.349259004181727, Validation Accuracy: 0.06369346733668342

Epoch 4, Validation Loss: 0.34925065960540963, Validation Accuracy: 0.06615825035014544

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3495471881281945, Validation Accuracy: 0.1089505143531464

Epoch 1, Validation Loss: 0.3493802623624541, Validation Accuracy: 0.0717104486649869

Epoch 2, Validation Loss: 0.34941442506780696, Validation Accuracy: 0.0743565667138723

Epoch 3, Validation Loss: 0.34939205683490476, Validation Accuracy: 0.07184487437985153

Epoch 4, Validation Loss: 0.3494331220687175, Validation Accuracy: 0.08731408753469426

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.35048030712468453, Validation Accuracy: 0.4274910952177024

Epoch 1, Validation Loss: 0.350749390148939, Validation Accuracy: 0.4978498375831969

Epoch 2, Validation Loss: 0.35067762881887166, Validation Accuracy: 0.4812898160667691

Epoch 3, Validation Loss: 0.35059578801798763, Validation Accuracy: 0.4589683665590071

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.35111872840755926, Validation Accuracy: 0.20921784771516308

Epoch 1, Validation Loss: 0.35086058283562105, Validation Accuracy: 0.1717796762359219

Epoch 2, Validation Loss: 0.35022904707243663, Validation Accuracy: 0.09481009508712258

Epoch 3, Validation Loss: 0.3507726023126181, Validation Accuracy: 0.1620435447297949

Epoch 4, Validation Loss: 0.3506778999238689, Validation Accuracy: 0.159391032218346

Epoch 5, Validation Loss: 0.3510453309817586, Validation Accuracy: 0.19972497376732062

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3528716036167097, Validation Accuracy: 0.5650375756705546

Epoch 1, Validation Loss: 0.35281678080262974, Validation Accuracy: 0.5421713939835392

Epoch 2, Validation Loss: 0.35287748702406585, Validation Accuracy: 0.5545513995922398

Epoch 3, Validation Loss: 0.3529669121092661, Validation Accuracy: 0.5730933860622335

Epoch 4, Validation Loss: 0.3531567011370552, Validation Accuracy: 0.5955688542916628

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3534163434067672, Validation Accuracy: 0.8735398080267592

Epoch 1, Validation Loss: 0.3534359059321969, Validation Accuracy: 0.8749467689387137

Epoch 2, Validation Loss: 0.35342389936778446, Validation Accuracy: 0.863603016622204

Epoch 3, Validation Loss: 0.35339569298564355, Validation Accuracy: 0.864008536660442

Epoch 4, Validation Loss: 0.353390113517605, Validation Accuracy: 0.8714075723487928

Epoch 5, Validation Loss: 0.35337185046217284, Validation Accuracy:
0.8706906281422503

Epoch 6, Validation Loss: 0.35339981310125024, Validation Accuracy:
0.8682450810333678

Epoch 7, Validation Loss: 0.353381775522942, Validation Accuracy: 0.8546719636019502

Epoch 8, Validation Loss: 0.3532585933545683, Validation Accuracy: 0.8394368437390168

Epoch 9, Validation Loss: 0.35314124290168136, Validation Accuracy:
0.8249680032214792

Epoch 10, Validation Loss: 0.352338600321384, Validation Accuracy: 0.6642303381880384

Epoch 11, Validation Loss: 0.3518407468316573, Validation Accuracy:
0.5741243349460518

Epoch 12, Validation Loss: 0.351639183298234, Validation Accuracy: 0.531994141141041

Epoch 13, Validation Loss: 0.35096592679804667, Validation Accuracy:
0.32221102124679685

Epoch 14, Validation Loss: 0.35092925981019923, Validation Accuracy:
0.33298006107418715

Epoch 15, Validation Loss: 0.3508360703884816, Validation Accuracy:
0.29943060863320425

Epoch 16, Validation Loss: 0.3513570750321703, Validation Accuracy:
0.4472679144426176

Epoch 17, Validation Loss: 0.35158867109798025, Validation Accuracy:
0.4779978294167905

Epoch 18, Validation Loss: 0.3513497767170369, Validation Accuracy: 0.418176641392118

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34934022800798153, Validation Accuracy: 0.027556600215033346

Epoch 1, Validation Loss: 0.34933300564070197, Validation Accuracy: 0.02776701669407536

Epoch 2, Validation Loss: 0.3493280209619413, Validation Accuracy: 0.027666990692174914

Epoch 3, Validation Loss: 0.3493233527202464, Validation Accuracy: 0.02725618192692838

Epoch 4, Validation Loss: 0.349312334883006, Validation Accuracy: 0.027272167614044447

Epoch 5, Validation Loss: 0.34930656099733587, Validation Accuracy: 0.027241467795740312

Epoch 6, Validation Loss: 0.34931789438422794, Validation Accuracy: 0.02706426255079841

Epoch 7, Validation Loss: 0.3493239938769092, Validation Accuracy: 0.02699556100350555

Epoch 8, Validation Loss: 0.3493162701946334, Validation Accuracy: 0.026969491003757517

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.35393649154797974, Validation Accuracy: 0.9505894484117212

Epoch 1, Validation Loss: 0.35390421836902725, Validation Accuracy: 0.9543036948895226

Epoch 2, Validation Loss: 0.35390533436616656, Validation Accuracy: 0.9495661633032136

Epoch 3, Validation Loss: 0.35386813810977985, Validation Accuracy: 0.942440122447096

Epoch 4, Validation Loss: 0.353879496418217, Validation Accuracy: 0.9391679446869406

Epoch 5, Validation Loss: 0.35386700414250566, Validation Accuracy: 0.9415488440122142

Epoch 6, Validation Loss: 0.3539001864771689, Validation Accuracy: 0.9565895569677083

Epoch 7, Validation Loss: 0.3538997526795929, Validation Accuracy: 0.9582151557892038

Epoch 8, Validation Loss: 0.3538650184795815, Validation Accuracy: 0.9580198974606244

Epoch 9, Validation Loss: 0.35391923999668057, Validation Accuracy: 0.959689827066281

Epoch 10, Validation Loss: 0.35389658424162096, Validation Accuracy: 0.9591830975798714

Epoch 11, Validation Loss: 0.3539071455043244, Validation Accuracy: 0.9582628863466685

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3516670210337816, Validation Accuracy: 0.5598420732630239

Epoch 1, Validation Loss: 0.3500989669605757, Validation Accuracy: 0.33550864609867403

Epoch 2, Validation Loss: 0.35011896794250524, Validation Accuracy: 0.33838929169562687

Epoch 3, Validation Loss: 0.3500599812337246, Validation Accuracy: 0.3464749500488611

Epoch 4, Validation Loss: 0.3500623629791269, Validation Accuracy: 0.342815001026062

Epoch 5, Validation Loss: 0.35165347243952694, Validation Accuracy: 0.6930911721102498

Epoch 6, Validation Loss: 0.35109499000733896, Validation Accuracy: 0.601735731761737

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3539121502238527, Validation Accuracy: 0.9597408191836881

Epoch 1, Validation Loss: 0.35388992101915423, Validation Accuracy: 0.9701295403893649

Epoch 2, Validation Loss: 0.35388547337380594, Validation Accuracy: 0.9728633059572481

Epoch 3, Validation Loss: 0.35389708644403123, Validation Accuracy: 0.9748732891469846

Epoch 4, Validation Loss: 0.35388352010149515, Validation Accuracy: 0.9747346121194868

Epoch 5, Validation Loss: 0.35388511204837864, Validation Accuracy: 0.9749207293922074

Epoch 6, Validation Loss: 0.35387189889664095, Validation Accuracy: 0.9750108982742263

Epoch 7, Validation Loss: 0.35389897168126355, Validation Accuracy: 0.974890546893635

Epoch 8, Validation Loss: 0.35386065654364174, Validation Accuracy: 0.9750522683837205

Epoch 9, Validation Loss: 0.3538879390537887, Validation Accuracy: 0.9749819211299678

Epoch 10, Validation Loss: 0.3538742571255705, Validation Accuracy: 0.9749714039506148

Epoch 11, Validation Loss: 0.35389508377233747, Validation Accuracy: 0.9749292118924021

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.35176643448195444, Validation Accuracy: 0.45134170956085073

Epoch 1, Validation Loss: 0.3493430730574776, Validation Accuracy: 0.09121230702917942

Epoch 2, Validation Loss: 0.3538897365849308, Validation Accuracy: 0.974968251728517

Epoch 3, Validation Loss: 0.35387360029125925, Validation Accuracy: 0.975010006260327

Epoch 4, Validation Loss: 0.35386569454119754, Validation Accuracy: 0.9750257156122625

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3498522878876395, Validation Accuracy: 0.08563153965929

Epoch 1, Validation Loss: 0.3495855712269435, Validation Accuracy: 0.050686621841064934

Epoch 2, Validation Loss: 0.34956086340080716, Validation Accuracy: 0.04414629644819949

Epoch 3, Validation Loss: 0.3495113939120811, Validation Accuracy: 0.035286875785477956

Epoch 4, Validation Loss: 0.34935572824762123, Validation Accuracy: 0.027137700030532157

Epoch 5, Validation Loss: 0.3493484138111323, Validation Accuracy: 0.027299289171863417

Epoch 6, Validation Loss: 0.34932658771427333, Validation Accuracy: 0.026770501898799138

Epoch 7, Validation Loss: 0.3493443350342308, Validation Accuracy: 0.026913351012264115

Epoch 8, Validation Loss: 0.3493284540939568, Validation Accuracy: 0.026753347375334482

Epoch 9, Validation Loss: 0.3493419633461879, Validation Accuracy: 0.02734760782181088

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.34938034740630214, Validation Accuracy: 0.05200516203187016

Epoch 1, Validation Loss: 0.34930819583589917, Validation Accuracy: 0.027211861580689018

Epoch 2, Validation Loss: 0.3493285792193401, Validation Accuracy: 0.029509735289366186

Epoch 3, Validation Loss: 0.34933895856215996, Validation Accuracy: 0.0347655658767967

Epoch 4, Validation Loss: 0.3493113136173182, Validation Accuracy: 0.02720364390848168

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.34933789137279425, Validation Accuracy: 0.028483342182278

Epoch 1, Validation Loss: 0.3492963176507216, Validation Accuracy: 0.02503487751836199

Epoch 2, Validation Loss: 0.34930066856793673, Validation Accuracy: 0.025012442086576398

Epoch 3, Validation Loss: 0.34929686407593286, Validation Accuracy: 0.025059068904743215

Epoch 4, Validation Loss: 0.34930176030909155, Validation Accuracy: 0.025013019597380174

Early stopping due to no improvement.

Tuning GCN with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.35186603450893467, Validation Accuracy: 0.5561642430304429

Epoch 1, Validation Loss: 0.3493694773974549, Validation Accuracy: 0.04719381212749151

Epoch 2, Validation Loss: 0.3493862392440919, Validation Accuracy: 0.050757645707016304

Epoch 3, Validation Loss: 0.3493936799891829, Validation Accuracy: 0.06218944398127365

Epoch 4, Validation Loss: 0.34949271147955147, Validation Accuracy: 0.09255673556061068

Early stopping due to no improvement.

Best parameters for GCN with Focal Loss: {'learning_rate': 0.01, 'hidden_channels': 32, 'dropout_rate': 0.5, 'heads': 1}

Best validation accuracy for GCN: 0.9750257156122625

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.3532671954288672, Validation Accuracy: 0.4416847538855451

Epoch 1, Validation Loss: 0.353317254086582, Validation Accuracy: 0.44087014756483384

Epoch 2, Validation Loss: 0.353286709442328, Validation Accuracy: 0.44191116685518766

Epoch 3, Validation Loss: 0.3532987716919731, Validation Accuracy: 0.4406790533692224

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3535935682043544, Validation Accuracy: 0.9299473977127879

Epoch 1, Validation Loss: 0.35354823990731915, Validation Accuracy: 0.928470265860004

Epoch 2, Validation Loss: 0.35357115101577624, Validation Accuracy:
0.9283781183864555

Epoch 3, Validation Loss: 0.35352049298381094, Validation Accuracy:
0.9253019960340976

Epoch 4, Validation Loss: 0.35355978945348754, Validation Accuracy:
0.9257327352972101

Epoch 5, Validation Loss: 0.353531328975119, Validation Accuracy: 0.9257531260019237

Epoch 6, Validation Loss: 0.3535513934811055, Validation Accuracy: 0.926578135300621

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35392121464088006, Validation Accuracy:
0.5405559332469632

Epoch 1, Validation Loss: 0.35394957498936147, Validation Accuracy:
0.5404681793935415

Epoch 2, Validation Loss: 0.35394643369146966, Validation Accuracy:
0.5420389567412401

Epoch 3, Validation Loss: 0.35396981379826076, Validation Accuracy:
0.5428488619633632

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3512231973057645, Validation Accuracy: 0.16919072772962715

Epoch 1, Validation Loss: 0.35120273309369243, Validation Accuracy: 0.1658912183686346

Epoch 2, Validation Loss: 0.3511951709207767, Validation Accuracy: 0.16721744708146247

Epoch 3, Validation Loss: 0.3511693135236688, Validation Accuracy: 0.16610433028944716

Epoch 4, Validation Loss: 0.35119866629688085, Validation Accuracy: 0.1669788181687568

Epoch 5, Validation Loss: 0.351199898619214, Validation Accuracy: 0.16638619246003242

Epoch 6, Validation Loss: 0.3512121342104067, Validation Accuracy: 0.1658117729128624

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3503090387982115, Validation Accuracy: 0.37743204633006583

Epoch 1, Validation Loss: 0.35028559413204713, Validation Accuracy: 0.37410249109224814

Epoch 2, Validation Loss: 0.35035192803768606, Validation Accuracy: 0.3745095271700776

Epoch 3, Validation Loss: 0.3502584879214947, Validation Accuracy: 0.36948019808328014

Epoch 4, Validation Loss: 0.3502412895410883, Validation Accuracy: 0.37078299959972494

Epoch 5, Validation Loss: 0.3503008054444571, Validation Accuracy: 0.3706500016675261

Epoch 6, Validation Loss: 0.35031171131962285, Validation Accuracy: 0.36956856267920984

Epoch 7, Validation Loss: 0.3502707053946502, Validation Accuracy: 0.37106158631495

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3539303612176597, Validation Accuracy: 0.9494248273455859

Epoch 1, Validation Loss: 0.3539246703791559, Validation Accuracy: 0.9496472640517175

Epoch 2, Validation Loss: 0.3539239840383269, Validation Accuracy: 0.9499724277671621

Epoch 3, Validation Loss: 0.3539113700389862, Validation Accuracy: 0.9496081374020343
Epoch 4, Validation Loss: 0.3539106130008366, Validation Accuracy: 0.9496629663068905
Epoch 5, Validation Loss: 0.3538958606294012, Validation Accuracy: 0.9499198584379448
Epoch 6, Validation Loss: 0.3539296495855298, Validation Accuracy: 0.9497030414202702
Epoch 7, Validation Loss: 0.3539291321491781, Validation Accuracy: 0.9495907599732217
Epoch 8, Validation Loss: 0.3539141378095073, Validation Accuracy: 0.9500478483630216
Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.35384269239884747, Validation Accuracy:
0.7586770414040273

Epoch 1, Validation Loss: 0.3538167787248976, Validation Accuracy: 0.7589081860393525

Epoch 2, Validation Loss: 0.3538257815405985, Validation Accuracy: 0.7597305485225573

Epoch 3, Validation Loss: 0.35384200280416694, Validation Accuracy:
0.7586859225764776

Epoch 4, Validation Loss: 0.3538417363580936, Validation Accuracy: 0.7584722610567143

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3498725771312382, Validation Accuracy:
0.08331259923510416

Epoch 1, Validation Loss: 0.34988732735808964, Validation Accuracy:
0.08311255305779613

Epoch 2, Validation Loss: 0.34989566476114337, Validation Accuracy:
0.08178351859264506

Epoch 3, Validation Loss: 0.3499111600460545, Validation Accuracy:
0.08190376032421895

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.35194588491401957, Validation Accuracy:
0.4444270663736895

Epoch 1, Validation Loss: 0.3519380983732474, Validation Accuracy: 0.4444475787011868

Epoch 2, Validation Loss: 0.352013454321892, Validation Accuracy: 0.4503558463400127

Epoch 3, Validation Loss: 0.35203005695165535, Validation Accuracy: 0.4510061915534284

Epoch 4, Validation Loss: 0.3519931860804262, Validation Accuracy: 0.44815156879345286

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.3496321893803239, Validation Accuracy: 0.048620283714500424

Epoch 1, Validation Loss: 0.3496159891188884, Validation Accuracy: 0.04816706121936019

Epoch 2, Validation Loss: 0.34958973386447423, Validation Accuracy: 0.046393022062596205

Epoch 3, Validation Loss: 0.3495687161278784, Validation Accuracy: 0.04546165302518014

Epoch 4, Validation Loss: 0.349553069538869, Validation Accuracy: 0.04289938172987417

Epoch 5, Validation Loss: 0.34956945216389507, Validation Accuracy: 0.04288136941245289

Epoch 6, Validation Loss: 0.349578436491803, Validation Accuracy: 0.042206634779374995

Epoch 7, Validation Loss: 0.3495642400113288, Validation Accuracy: 0.04227852973250369

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3512411532419787, Validation Accuracy: 0.5350347052171929

Epoch 1, Validation Loss: 0.35123630278459556, Validation Accuracy: 0.5320726257843081

Epoch 2, Validation Loss: 0.35127306139794534, Validation Accuracy: 0.5369608170177824

Epoch 3, Validation Loss: 0.35120959568851934, Validation Accuracy: 0.5343324851743172

Epoch 4, Validation Loss: 0.3511797809423347, Validation Accuracy: 0.511793656533637

Epoch 5, Validation Loss: 0.3511342239143239, Validation Accuracy: 0.50794998832582

Epoch 6, Validation Loss: 0.3510544865805813, Validation Accuracy: 0.4898966967059409

Epoch 7, Validation Loss: 0.3510023670516002, Validation Accuracy: 0.4795975405254332

Epoch 8, Validation Loss: 0.351017837710771, Validation Accuracy: 0.47401053276932825

Epoch 9, Validation Loss: 0.35100604242485745, Validation Accuracy: 0.47679908448499714

Epoch 10, Validation Loss: 0.35094252820346256, Validation Accuracy: 0.4581630375381963

Epoch 11, Validation Loss: 0.3508006905207859, Validation Accuracy: 0.45009772187482366

Epoch 12, Validation Loss: 0.3507904453993435, Validation Accuracy: 0.4457287386042407

Epoch 13, Validation Loss: 0.35092661768271965, Validation Accuracy: 0.467704419854082

Epoch 14, Validation Loss: 0.35091356922024236, Validation Accuracy: 0.46804324684818716

Epoch 15, Validation Loss: 0.3512580567051104, Validation Accuracy: 0.5559391592069152

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35650467569419825, Validation Accuracy: 0.6363020795929045

Epoch 1, Validation Loss: 0.35621467010850644, Validation Accuracy: 0.6527530240823894

Epoch 2, Validation Loss: 0.35625140919874676, Validation Accuracy: 0.651419230502742

Epoch 3, Validation Loss: 0.3560339795152839, Validation Accuracy: 0.657122998163594

Epoch 4, Validation Loss: 0.35535410527260075, Validation Accuracy: 0.69797483615283

Epoch 5, Validation Loss: 0.3542698996682321, Validation Accuracy: 0.7421493200481264

Epoch 6, Validation Loss: 0.35436561356111435, Validation Accuracy: 0.7446880520592692

Epoch 7, Validation Loss: 0.3541408642645805, Validation Accuracy: 0.7527750420616357

Epoch 8, Validation Loss: 0.35391577457080114, Validation Accuracy: 0.7629270870476449

Epoch 9, Validation Loss: 0.35382262508271645, Validation Accuracy: 0.7657491068474601

Epoch 10, Validation Loss: 0.35380380155135027, Validation Accuracy: 0.7715472801415711

Epoch 11, Validation Loss: 0.35374340230122986, Validation Accuracy: 0.7754314778098959

Epoch 12, Validation Loss: 0.35361308310522926, Validation Accuracy: 0.7816559503261068

Epoch 13, Validation Loss: 0.3535838314232696, Validation Accuracy: 0.7841082268186179

Epoch 14, Validation Loss: 0.35355820260923493, Validation Accuracy: 0.7849500420590468

Epoch 15, Validation Loss: 0.3535590528258615, Validation Accuracy: 0.7806975914957147

Epoch 16, Validation Loss: 0.3535654816231124, Validation Accuracy: 0.7817749985893168

Epoch 17, Validation Loss: 0.35353070911639384, Validation Accuracy: 0.7807719741170072

Epoch 18, Validation Loss: 0.3535059649802319, Validation Accuracy: 0.7831943290349717

Epoch 19, Validation Loss: 0.35347593082091944, Validation Accuracy: 0.7807723982933656

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.35141595406804427, Validation Accuracy: 0.6212141034027217

Epoch 1, Validation Loss: 0.3513516444278414, Validation Accuracy: 0.6211259767603484

Epoch 2, Validation Loss: 0.35134555270003326, Validation Accuracy: 0.616195566000703

Epoch 3, Validation Loss: 0.3513955756393319, Validation Accuracy: 0.623768040099942

Epoch 4, Validation Loss: 0.35138570374945555, Validation Accuracy: 0.6144609842828774

Epoch 5, Validation Loss: 0.351406369552423, Validation Accuracy: 0.612908108551872

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.34941752909430795, Validation Accuracy: 0.038647330602067174

Epoch 1, Validation Loss: 0.34941765614242176, Validation Accuracy: 0.03984750606743187

Epoch 2, Validation Loss: 0.3493857395560215, Validation Accuracy: 0.03637599035922156

Epoch 3, Validation Loss: 0.34938227775374947, Validation Accuracy: 0.035991583917070795

Epoch 4, Validation Loss: 0.34937505191076484, Validation Accuracy: 0.03629646732856153

Epoch 5, Validation Loss: 0.3493831019395634, Validation Accuracy: 0.03610648875806704

Epoch 6, Validation Loss: 0.3493837821424451, Validation Accuracy: 0.035891584183804295

Epoch 7, Validation Loss: 0.34938748487763605, Validation Accuracy: 0.03578391634941972

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3538395178229282, Validation Accuracy: 0.9418015740116269

Epoch 1, Validation Loss: 0.3538002758552655, Validation Accuracy: 0.9458694062872753

Epoch 2, Validation Loss: 0.3538055217295663, Validation Accuracy: 0.9429863719393305

Epoch 3, Validation Loss: 0.3538170049415333, Validation Accuracy: 0.9427805566243427

Epoch 4, Validation Loss: 0.3537932533780044, Validation Accuracy: 0.9436161373707533

Epoch 5, Validation Loss: 0.3538490989367956, Validation Accuracy: 0.9453001361981979

Epoch 6, Validation Loss: 0.3538019398305907, Validation Accuracy: 0.9432676150284124

Epoch 7, Validation Loss: 0.3538221667333513, Validation Accuracy: 0.9380020930160977

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.34949929476080105, Validation Accuracy: 0.06563986816625415

Epoch 1, Validation Loss: 0.3495220391833161, Validation Accuracy: 0.06599436414591682

Epoch 2, Validation Loss: 0.34948929796739486, Validation Accuracy: 0.058988627121992265

Epoch 3, Validation Loss: 0.34944043813213227, Validation Accuracy: 0.04982716530587125

Epoch 4, Validation Loss: 0.3493863290947661, Validation Accuracy: 0.047731148465848625

Epoch 5, Validation Loss: 0.349377632436918, Validation Accuracy: 0.04406792704512223

Epoch 6, Validation Loss: 0.3493867265083654, Validation Accuracy: 0.04403540277065161

Epoch 7, Validation Loss: 0.3493579402750834, Validation Accuracy: 0.041061042784314127

Epoch 8, Validation Loss: 0.34937202863894384, Validation Accuracy: 0.043025310061717476

Epoch 9, Validation Loss: 0.34935480156548265, Validation Accuracy: 0.03787064518363274

Epoch 10, Validation Loss: 0.34935607034574373, Validation Accuracy: 0.03492714959983583

Epoch 11, Validation Loss: 0.34935558093688623, Validation Accuracy: 0.03569101143774919

Epoch 12, Validation Loss: 0.34932693003424936, Validation Accuracy: 0.03165188569610804

Epoch 13, Validation Loss: 0.3493110467275378, Validation Accuracy: 0.02765523043460418

Epoch 14, Validation Loss: 0.3493253795000223, Validation Accuracy: 0.030273181993074258

Epoch 15, Validation Loss: 0.3493366170461953, Validation Accuracy: 0.03000048739569091

Epoch 16, Validation Loss: 0.34934049334478734, Validation Accuracy: 0.0291385904206884

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3512977144262631, Validation Accuracy: 0.2915243888360113

Epoch 1, Validation Loss: 0.3512341174535065, Validation Accuracy: 0.2876482842131188

Epoch 2, Validation Loss: 0.35128006775385096, Validation Accuracy: 0.29899083157017375

Epoch 3, Validation Loss: 0.3513411584474313, Validation Accuracy: 0.2992543266751999

Epoch 4, Validation Loss: 0.35133626724295225, Validation Accuracy: 0.29577721430624565

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3532770906133628, Validation Accuracy: 0.845005873029714

Epoch 1, Validation Loss: 0.3532785001227045, Validation Accuracy: 0.799720829505858

Epoch 2, Validation Loss: 0.35349836753260705, Validation Accuracy: 0.8264251429568269

Epoch 3, Validation Loss: 0.35338531157219083, Validation Accuracy: 0.7903920386780717

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35396832523511595, Validation Accuracy: 0.968989046507452

Epoch 1, Validation Loss: 0.3539351900813006, Validation Accuracy: 0.9707352477283977

Epoch 2, Validation Loss: 0.35389973700194444, Validation Accuracy:
0.9715569515333944

Epoch 3, Validation Loss: 0.35393780713933276, Validation Accuracy:
0.9714688062710656

Epoch 4, Validation Loss: 0.35390887374321817, Validation Accuracy:
0.9731825143733821

Epoch 5, Validation Loss: 0.3538963956661319, Validation Accuracy: 0.9734252246198198

Epoch 6, Validation Loss: 0.35388682771557317, Validation Accuracy:
0.9741115761828553

Epoch 7, Validation Loss: 0.3538928120662793, Validation Accuracy: 0.974242222131013

Epoch 8, Validation Loss: 0.35388129757296655, Validation Accuracy:
0.9744241653026564

Epoch 9, Validation Loss: 0.35388754482008977, Validation Accuracy:
0.9748563863495835

Epoch 10, Validation Loss: 0.35387909538101026, Validation Accuracy:
0.9748680134386317

Epoch 11, Validation Loss: 0.3538861245878281, Validation Accuracy: 0.974975701452271

Epoch 12, Validation Loss: 0.35385531460676833, Validation Accuracy:
0.9750727685383461

Epoch 13, Validation Loss: 0.3538833205812326, Validation Accuracy:
0.9749771703553216

Epoch 14, Validation Loss: 0.3538993198433822, Validation Accuracy:
0.9749224743569027

Epoch 15, Validation Loss: 0.35386497640136455, Validation Accuracy:
0.9750595348073331

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.353060281602088, Validation Accuracy: 0.6518902750307201

Epoch 1, Validation Loss: 0.35337859488302664, Validation Accuracy:
0.8508508842371546

Epoch 2, Validation Loss: 0.35321791599465363, Validation Accuracy: 0.5175678205848331

Epoch 3, Validation Loss: 0.35309458015574413, Validation Accuracy: 0.5072663010859696

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35397138466906014, Validation Accuracy: 0.9715293906304133

Epoch 1, Validation Loss: 0.35389863912284225, Validation Accuracy: 0.9745874274100629

Epoch 2, Validation Loss: 0.35391958852855504, Validation Accuracy: 0.9744946126218573

Epoch 3, Validation Loss: 0.35389190061808223, Validation Accuracy: 0.9746394190690433

Epoch 4, Validation Loss: 0.35388329336720126, Validation Accuracy: 0.9748294730145375

Epoch 5, Validation Loss: 0.35388297774359845, Validation Accuracy: 0.9723288120985779

Epoch 6, Validation Loss: 0.3539359977020519, Validation Accuracy: 0.9699395661898996

Epoch 7, Validation Loss: 0.3538796970477471, Validation Accuracy: 0.9720802222296322

Epoch 8, Validation Loss: 0.3532163499306804, Validation Accuracy: 0.8227799415898933

Epoch 9, Validation Loss: 0.35334841555756313, Validation Accuracy: 0.9326552860752351

Epoch 10, Validation Loss: 0.3532808780226459, Validation Accuracy: 0.9308792406849227

Epoch 11, Validation Loss: 0.35327072060729375, Validation Accuracy: 0.9322924146987013

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.35073798199741185, Validation Accuracy: 0.166989026098288

Epoch 1, Validation Loss: 0.3504214193625722, Validation Accuracy: 0.13174015362071134

Epoch 2, Validation Loss: 0.34966465712481043, Validation Accuracy: 0.06678993381016005

Epoch 3, Validation Loss: 0.34959738219050557, Validation Accuracy: 0.06374792226714002

Epoch 4, Validation Loss: 0.34988924461617954, Validation Accuracy: 0.08380197715120975

Epoch 5, Validation Loss: 0.34941003429091005, Validation Accuracy: 0.04301522077042646

Epoch 6, Validation Loss: 0.3494502149208012, Validation Accuracy: 0.046009295739965525

Epoch 7, Validation Loss: 0.3494558179792636, Validation Accuracy: 0.04899921783841311

Epoch 8, Validation Loss: 0.34941732180917234, Validation Accuracy: 0.053281683027439436

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3499899595310315, Validation Accuracy: 0.10620370441640944

Epoch 1, Validation Loss: 0.34959125666701174, Validation Accuracy: 0.05922809537857702

Epoch 2, Validation Loss: 0.34969622584489674, Validation Accuracy: 0.06966203945950937

Epoch 3, Validation Loss: 0.3498598073907289, Validation Accuracy: 0.08721835365931853

Epoch 4, Validation Loss: 0.34962584999004015, Validation Accuracy: 0.06212803056527815

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3521169036552865, Validation Accuracy: 0.6556866105051459

Epoch 1, Validation Loss: 0.3522802949987038, Validation Accuracy: 0.6509441944540595

Epoch 2, Validation Loss: 0.35150032178048163, Validation Accuracy: 0.4176073103405814

Epoch 3, Validation Loss: 0.3507342314897637, Validation Accuracy: 0.23912318505977118

Epoch 4, Validation Loss: 0.35059920752018914, Validation Accuracy: 0.23499245774799643

Epoch 5, Validation Loss: 0.3502608907429811, Validation Accuracy: 0.1632640499004863

Epoch 6, Validation Loss: 0.34945722090695097, Validation Accuracy: 0.05358443343488117

Epoch 7, Validation Loss: 0.3494494738561048, Validation Accuracy: 0.04858405513477189

Epoch 8, Validation Loss: 0.35067030395526744, Validation Accuracy: 0.24434514495616172

Epoch 9, Validation Loss: 0.3503935694250812, Validation Accuracy: 0.18832464654341

Epoch 10, Validation Loss: 0.3505928801839464, Validation Accuracy: 0.21377114621869436

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3535402434191692, Validation Accuracy: 0.847627891704419

Epoch 1, Validation Loss: 0.35177056879618623, Validation Accuracy: 0.45491134642615283

Epoch 2, Validation Loss: 0.3521606056181432, Validation Accuracy: 0.5625962110794114

Epoch 3, Validation Loss: 0.3509947504506218, Validation Accuracy: 0.3116219405818667

Epoch 4, Validation Loss: 0.350980783070879, Validation Accuracy: 0.32412480017243545

Epoch 5, Validation Loss: 0.3507937381492359, Validation Accuracy: 0.26763420564007345

Epoch 6, Validation Loss: 0.35123274270121574, Validation Accuracy: 0.3503204643206131

Epoch 7, Validation Loss: 0.3510505997809228, Validation Accuracy: 0.3115714600737447

Epoch 8, Validation Loss: 0.35027591769511884, Validation Accuracy: 0.19814248632898665

Epoch 9, Validation Loss: 0.3500363218133562, Validation Accuracy: 0.13029828926107365

Epoch 10, Validation Loss: 0.3502373071225642, Validation Accuracy: 0.157540271804223

Epoch 11, Validation Loss: 0.35038753012865415, Validation Accuracy: 0.1808397422253451

Epoch 12, Validation Loss: 0.3496795758124321, Validation Accuracy: 0.08915660178461965

Epoch 13, Validation Loss: 0.34981656984123344, Validation Accuracy: 0.14499245712878298

Epoch 14, Validation Loss: 0.3498741482238912, Validation Accuracy: 0.16309986197979467

Epoch 15, Validation Loss: 0.3501774669433054, Validation Accuracy: 0.18785510087816093

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.35390853164509567, Validation Accuracy: 0.9731554639196408

Epoch 1, Validation Loss: 0.35396472181634925, Validation Accuracy: 0.9721554327827374

Epoch 2, Validation Loss: 0.3539039925221474, Validation Accuracy: 0.9739758071962819

Epoch 3, Validation Loss: 0.3539660880642553, Validation Accuracy: 0.9598417378051127

Epoch 4, Validation Loss: 0.35244509858765616, Validation Accuracy: 0.7039000271832511

Epoch 5, Validation Loss: 0.35133700231760373, Validation Accuracy: 0.52039939572545

Epoch 6, Validation Loss: 0.35139285933882664, Validation Accuracy: 0.4735263352202806

Epoch 7, Validation Loss: 0.3511220616087428, Validation Accuracy: 0.5066845537047202

Epoch 8, Validation Loss: 0.35150355145002415, Validation Accuracy: 0.5996907858807603

Epoch 9, Validation Loss: 0.35226855554592523, Validation Accuracy: 0.7064003447444428

Epoch 10, Validation Loss: 0.35262357219868795, Validation Accuracy: 0.7422910143678824

Early stopping due to no improvement.

Tuning GAT with Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.34955425290552616, Validation Accuracy: 0.05217364538337626

Epoch 1, Validation Loss: 0.34933938355954647, Validation Accuracy: 0.02634427356390237

Epoch 2, Validation Loss: 0.3514223861191468, Validation Accuracy: 0.296373806464519

Epoch 3, Validation Loss: 0.34932790138289593, Validation Accuracy: 0.028136928949636743

Epoch 4, Validation Loss: 0.3493184825179003, Validation Accuracy: 0.026313359800572433

Epoch 5, Validation Loss: 0.3493056112424316, Validation Accuracy: 0.026372566373951703

Epoch 6, Validation Loss: 0.352691652978916, Validation Accuracy: 0.7866246286614367

Epoch 7, Validation Loss: 0.35386715197089885, Validation Accuracy: 0.9740133460927659

Epoch 8, Validation Loss: 0.35386963103604374, Validation Accuracy: 0.9739802697392383

Early stopping due to no improvement.

Best parameters for GAT with Focal Loss: {'learning_rate': 0.01, 'hidden_channels': 16, 'dropout_rate': 0.3, 'heads': 8}

Best validation accuracy for GAT: 0.9750595348073331

Evaluating GCN model with Focal Loss and the best hyperparameters...

Test Loss: 0.3506133946828156, Test Accuracy: 0.2559832629570309

Precision: 0.0245, F1 Score: 0.0474, Recall: 0.7445

Evaluating GCN model with Focal Loss and the best hyperparameters...

Test Loss: 0.3506133946828156, Test Accuracy: 0.2559832629570309

Precision: 0.0245, F1 Score: 0.0474, Recall: 0.7445

Evaluating GAT model with Focal Loss and the best hyperparameters...

Test Loss: 0.3518656944074938, Test Accuracy: 0.20439072332061214

Precision: 0.0276, F1 Score: 0.0535, Recall: 0.9047

SMOTE Focal Loss

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35059627158470247, Validation Accuracy: 0.044641689341851164

Epoch 1, Validation Loss: 0.35041196500101396, Validation Accuracy: 0.04231117448967291

Epoch 2, Validation Loss: 0.35030235279878374, Validation Accuracy: 0.040305855296255605

Epoch 3, Validation Loss: 0.35017685662428144, Validation Accuracy: 0.039829569357370795

Epoch 4, Validation Loss: 0.35010089575504844, Validation Accuracy: 0.03862729203648789

Epoch 5, Validation Loss: 0.35002044405298255, Validation Accuracy: 0.037838600451467266

Epoch 6, Validation Loss: 0.34996951617319, Validation Accuracy: 0.036967505321740916

Epoch 7, Validation Loss: 0.3499099678792078, Validation Accuracy: 0.036445381968235394

Epoch 8, Validation Loss: 0.3498700958475581, Validation Accuracy: 0.03592172510443405

Epoch 9, Validation Loss: 0.34985287838774937, Validation Accuracy: 0.03564382851762823

Epoch 10, Validation Loss: 0.349808555087144, Validation Accuracy: 0.03540100009492948

Epoch 11, Validation Loss: 0.3498002854973152, Validation Accuracy: 0.03512462417780879

Epoch 12, Validation Loss: 0.3497828916639607, Validation Accuracy: 0.03473444402826166

Epoch 13, Validation Loss: 0.3497336412186067, Validation Accuracy: 0.03386181751002615

Epoch 14, Validation Loss: 0.3497316608062157, Validation Accuracy: 0.03393405645924911

Epoch 15, Validation Loss: 0.3496923168598866, Validation Accuracy: 0.03354773162840936

Epoch 16, Validation Loss: 0.34970060833926236, Validation Accuracy: 0.03365817495273593

Epoch 17, Validation Loss: 0.34968276303400175, Validation Accuracy: 0.03315202052597819

Epoch 18, Validation Loss: 0.34966964476161794, Validation Accuracy: 0.033346585444052584

Epoch 19, Validation Loss: 0.34965146475335207, Validation Accuracy: 0.03269524796568602

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.35494707580239837, Validation Accuracy: 0.9058402829973295

Epoch 1, Validation Loss: 0.3560442156886344, Validation Accuracy: 0.7961132681270547

Epoch 2, Validation Loss: 0.35731064097461274, Validation Accuracy: 0.6784176464852271

Epoch 3, Validation Loss: 0.3588999608905972, Validation Accuracy: 0.5937043173180002

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35395823637250046, Validation Accuracy:
0.9750404022266116

Epoch 1, Validation Loss: 0.3540002793887117, Validation Accuracy: 0.9749744742202452

Epoch 2, Validation Loss: 0.35401148861158577, Validation Accuracy:
0.9750150017694394

Epoch 3, Validation Loss: 0.3540645005833126, Validation Accuracy: 0.9750205916540294

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3495980630589478, Validation Accuracy:
0.028401456484947945

Epoch 1, Validation Loss: 0.3494892218716387, Validation Accuracy:
0.026045742996517827

Epoch 2, Validation Loss: 0.3494157751943574, Validation Accuracy:
0.02522726864526591

Epoch 3, Validation Loss: 0.34938898778730826, Validation Accuracy:
0.0250831787760086

Epoch 4, Validation Loss: 0.3493835376598699, Validation Accuracy:
0.025007503020446693

Epoch 5, Validation Loss: 0.3493610589439165, Validation Accuracy:
0.025083298919358437

Epoch 6, Validation Loss: 0.3493626644238645, Validation Accuracy:
0.024983644410236674

Epoch 7, Validation Loss: 0.3493501202344303, Validation Accuracy:
0.025024827235798436

Epoch 8, Validation Loss: 0.34934230877211314, Validation Accuracy:
0.02505901067323481

Epoch 9, Validation Loss: 0.3493358282829928, Validation Accuracy:
0.02506088157026978

Epoch 10, Validation Loss: 0.3493387338984989, Validation Accuracy:
0.025037842830387153

Epoch 11, Validation Loss: 0.3493370880412109, Validation Accuracy:
0.0250192396490688

Epoch 12, Validation Loss: 0.3493337000422087, Validation Accuracy: 0.0250159042869749

Epoch 13, Validation Loss: 0.3493191492616687, Validation Accuracy: 0.025087903908836588

Epoch 14, Validation Loss: 0.34934072799185667, Validation Accuracy: 0.02494906521192464

Epoch 15, Validation Loss: 0.3493249488823467, Validation Accuracy: 0.0250161642907725

Epoch 16, Validation Loss: 0.34933535115002995, Validation Accuracy: 0.024964739069111425

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3513247892075674, Validation Accuracy: 0.1333519666241862

Epoch 1, Validation Loss: 0.3506251534368501, Validation Accuracy: 0.08375524448607244

Epoch 2, Validation Loss: 0.35023333239496196, Validation Accuracy: 0.059260190597400196

Epoch 3, Validation Loss: 0.35001171781466556, Validation Accuracy: 0.051357710456025475

Epoch 4, Validation Loss: 0.3499085091183854, Validation Accuracy: 0.04728332007288966

Epoch 5, Validation Loss: 0.3498632171313757, Validation Accuracy: 0.046072769164060313

Epoch 6, Validation Loss: 0.34978245461253316, Validation Accuracy: 0.04443116107482414

Epoch 7, Validation Loss: 0.34973657463975344, Validation Accuracy: 0.04250849092420247

Epoch 8, Validation Loss: 0.34970255991069615, Validation Accuracy: 0.041394967036913526

Epoch 9, Validation Loss: 0.3496823360399336, Validation Accuracy: 0.040580379478890045

Epoch 10, Validation Loss: 0.34965721711923115, Validation Accuracy: 0.03992109664378572

Epoch 11, Validation Loss: 0.34964643940144674, Validation Accuracy: 0.03879831188988801

Epoch 12, Validation Loss: 0.349570823958139, Validation Accuracy: 0.036186860265257435

Epoch 13, Validation Loss: 0.34955626622618874, Validation Accuracy: 0.03491394017758417

Epoch 14, Validation Loss: 0.34954184759639334, Validation Accuracy: 0.03410181038418723

Epoch 15, Validation Loss: 0.34952507953785783, Validation Accuracy: 0.03343794989183349

Epoch 16, Validation Loss: 0.3495053836045135, Validation Accuracy: 0.03282129176106551

Epoch 17, Validation Loss: 0.3494801857779103, Validation Accuracy: 0.03132774229950502

Epoch 18, Validation Loss: 0.3494427794262434, Validation Accuracy: 0.025096584524927273

Epoch 19, Validation Loss: 0.34944265444876244, Validation Accuracy: 0.02495574313056418

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3503418784431429, Validation Accuracy: 0.02518068642889752

Epoch 1, Validation Loss: 0.3500354951871536, Validation Accuracy: 0.024938660698703406

Epoch 2, Validation Loss: 0.3499401381086771, Validation Accuracy: 0.02487603030170877

Epoch 3, Validation Loss: 0.34985123349182656, Validation Accuracy: 0.02503359697986233

Epoch 4, Validation Loss: 0.3497971853902263, Validation Accuracy: 0.025045989485918366

Epoch 5, Validation Loss: 0.34976317739072565, Validation Accuracy: 0.024985960782503674

Epoch 6, Validation Loss: 0.3497189370633355, Validation Accuracy: 0.025047062625350724

Epoch 7, Validation Loss: 0.3496899461332089, Validation Accuracy: 0.025012507536592562

Epoch 8, Validation Loss: 0.34966072514098573, Validation Accuracy: 0.025040412593333845

Epoch 9, Validation Loss: 0.34964198961151444, Validation Accuracy: 0.024982877019806223

Epoch 10, Validation Loss: 0.3496261421711214, Validation Accuracy: 0.02496190686292114

Epoch 11, Validation Loss: 0.3496113983040708, Validation Accuracy: 0.024904696182203454

Epoch 12, Validation Loss: 0.3495671696609658, Validation Accuracy: 0.025077839274081446

Epoch 13, Validation Loss: 0.3495588860204143, Validation Accuracy: 0.0250347419862673

Epoch 14, Validation Loss: 0.34954433819792113, Validation Accuracy: 0.025014750776019085

Epoch 15, Validation Loss: 0.34952552930888703, Validation Accuracy: 0.0250520689053731

Epoch 16, Validation Loss: 0.3495197440347364, Validation Accuracy: 0.024998524668820223

Epoch 17, Validation Loss: 0.34950886019701993, Validation Accuracy: 0.02501955855382129

Epoch 18, Validation Loss: 0.34949361168717036, Validation Accuracy: 0.025025014752289812

Epoch 19, Validation Loss: 0.34949004435657566, Validation Accuracy: 0.0249968558221191

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.349784284682191, Validation Accuracy: 0.028885285106514006

Epoch 1, Validation Loss: 0.3495423438827098, Validation Accuracy: 0.025547744881728153

Epoch 2, Validation Loss: 0.34947290986998203, Validation Accuracy: 0.02518297405281757

Epoch 3, Validation Loss: 0.3494693525967468, Validation Accuracy: 0.024954147267433658

Epoch 4, Validation Loss: 0.3494416686056861, Validation Accuracy: 0.02502551530661962

Epoch 5, Validation Loss: 0.3494197651559011, Validation Accuracy: 0.025050359896842404

Epoch 6, Validation Loss: 0.3494284796359817, Validation Accuracy: 0.02496158670630696

Epoch 7, Validation Loss: 0.34940381041235724, Validation Accuracy: 0.025037698880830503

Epoch 8, Validation Loss: 0.3493943881456077, Validation Accuracy: 0.02506318395833066

Epoch 9, Validation Loss: 0.34940188538939426, Validation Accuracy:
0.02496631894992109

Epoch 10, Validation Loss: 0.349394535160538, Validation Accuracy:
0.024975435049758455

Epoch 11, Validation Loss: 0.34938576218508016, Validation Accuracy:
0.025011799228433062

Epoch 12, Validation Loss: 0.34938811309284373, Validation Accuracy:
0.024954837517705747

Epoch 13, Validation Loss: 0.34936785416922556, Validation Accuracy:
0.025051865490792434

Epoch 14, Validation Loss: 0.3493640117402704, Validation Accuracy:
0.02505266885468015

Epoch 15, Validation Loss: 0.34937224768231584, Validation Accuracy:
0.024947608995093074

Epoch 16, Validation Loss: 0.34936103113827577, Validation Accuracy:
0.025038276787981217

Epoch 17, Validation Loss: 0.34936095149286334, Validation Accuracy:
0.025008658619495364

Epoch 18, Validation Loss: 0.3493486680552622, Validation Accuracy:
0.025084697078111094

Epoch 19, Validation Loss: 0.34935076967362433, Validation Accuracy:
0.0250401555933021

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.34974328164131413, Validation Accuracy:
0.02664361281848686

Epoch 1, Validation Loss: 0.3495808347283167, Validation Accuracy:
0.025944406675303684

Epoch 2, Validation Loss: 0.34952358601998457, Validation Accuracy:
0.025055685002514805

Epoch 3, Validation Loss: 0.34948444506962306, Validation Accuracy:
0.025008852009791093

Epoch 4, Validation Loss: 0.34945751878227255, Validation Accuracy:
0.02501949037790817

Epoch 5, Validation Loss: 0.3494243905798673, Validation Accuracy:
0.025102531285187017

Epoch 6, Validation Loss: 0.3494112212811747, Validation Accuracy:
0.025071930823319433

Epoch 7, Validation Loss: 0.34940452426302226, Validation Accuracy:
0.025019494377411147

Epoch 8, Validation Loss: 0.3494005876202737, Validation Accuracy:
0.024971387219453613

Epoch 9, Validation Loss: 0.34938618814383193, Validation Accuracy:
0.02503386421476069

Epoch 10, Validation Loss: 0.34937017172501045, Validation Accuracy:
0.025073303627086554

Epoch 11, Validation Loss: 0.3493790648711231, Validation Accuracy:
0.0249657599244923

Epoch 12, Validation Loss: 0.3493639584954264, Validation Accuracy:
0.02504398405802305

Epoch 13, Validation Loss: 0.34935452092078423, Validation Accuracy:
0.025058888130513546

Epoch 14, Validation Loss: 0.3493400761122739, Validation Accuracy:
0.025125074044347113

Epoch 15, Validation Loss: 0.34933995823410546, Validation Accuracy:
0.025091527632750344

Epoch 16, Validation Loss: 0.3493494206563415, Validation Accuracy:
0.025022960374754363

Epoch 17, Validation Loss: 0.3493492905022784, Validation Accuracy:
0.025024110972031274

Epoch 18, Validation Loss: 0.349348902480478, Validation Accuracy:
0.02499173011188069

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.34989046695510445, Validation Accuracy:
0.035684500363106345

Epoch 1, Validation Loss: 0.34962624200520387, Validation Accuracy:
0.027804356246681254

Epoch 2, Validation Loss: 0.3495133570198977, Validation Accuracy:
0.02538479887349665

Epoch 3, Validation Loss: 0.3494844097949139, Validation Accuracy:
0.025108960266378672

Epoch 4, Validation Loss: 0.3494440598168385, Validation Accuracy:
0.02516879633404878

Epoch 5, Validation Loss: 0.34941597390115703, Validation Accuracy:
0.025215733468132003

Epoch 6, Validation Loss: 0.34940730741538717, Validation Accuracy: 0.025079672994318968

Epoch 7, Validation Loss: 0.3493964978985988, Validation Accuracy: 0.02506990226508991

Epoch 8, Validation Loss: 0.34938638337492645, Validation Accuracy: 0.02508136889540923

Epoch 9, Validation Loss: 0.34938572254725186, Validation Accuracy: 0.025032390481688153

Epoch 10, Validation Loss: 0.34936410617591723, Validation Accuracy: 0.025148634715118932

Epoch 11, Validation Loss: 0.34935981856090553, Validation Accuracy: 0.02512641414607629

Epoch 12, Validation Loss: 0.34937049518743757, Validation Accuracy: 0.025011868255943752

Epoch 13, Validation Loss: 0.34936865513437143, Validation Accuracy: 0.024977867874417827

Epoch 14, Validation Loss: 0.3493619983456567, Validation Accuracy: 0.024977096415749453

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34940901871946256, Validation Accuracy: 0.02523068716307364

Epoch 1, Validation Loss: 0.34934800619227124, Validation Accuracy: 0.025059121058382365

Epoch 2, Validation Loss: 0.3493117012693628, Validation Accuracy: 0.02509747588754361

Epoch 3, Validation Loss: 0.349307010324658, Validation Accuracy: 0.025052400951298542

Epoch 4, Validation Loss: 0.34929566932079514, Validation Accuracy: 0.025057444145826068

Epoch 5, Validation Loss: 0.3492988637156285, Validation Accuracy: 0.025013210751242836

Epoch 6, Validation Loss: 0.3492892865951245, Validation Accuracy: 0.02502693550869632

Epoch 7, Validation Loss: 0.34929219102741177, Validation Accuracy: 0.024965809926282865

Epoch 8, Validation Loss: 0.34929173911179856, Validation Accuracy: 0.024978902087731403

Epoch 9, Validation Loss: 0.34926830709128465, Validation Accuracy: 0.02511630532682246

Epoch 10, Validation Loss: 0.3492816479566967, Validation Accuracy: 0.0250354480817011

Epoch 11, Validation Loss: 0.3492849459571223, Validation Accuracy: 0.024998717488329145

Epoch 12, Validation Loss: 0.34928813524932484, Validation Accuracy: 0.024952483064476828

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.36755029579841764, Validation Accuracy: 0.974938687135073

Epoch 1, Validation Loss: 0.36735162479114297, Validation Accuracy: 0.027872578097916104

Epoch 2, Validation Loss: 0.36698318932843266, Validation Accuracy: 0.026226849416311458

Epoch 3, Validation Loss: 0.3664754234975384, Validation Accuracy: 0.025750984898227185

Epoch 4, Validation Loss: 0.36585460355500726, Validation Accuracy: 0.02545573901649097

Epoch 5, Validation Loss: 0.36517401967687585, Validation Accuracy: 0.02505080987867217

Epoch 6, Validation Loss: 0.36445458902614586, Validation Accuracy: 0.024976972949951125

Epoch 7, Validation Loss: 0.3637194154280291, Validation Accuracy: 0.025040480998950444

Epoch 8, Validation Loss: 0.3629998833162909, Validation Accuracy: 0.024997692047307903

Epoch 9, Validation Loss: 0.36231013008441876, Validation Accuracy: 0.024870349319093356

Epoch 10, Validation Loss: 0.36161807504836146, Validation Accuracy: 0.025086434192032665

Epoch 11, Validation Loss: 0.36098559685143883, Validation Accuracy: 0.025053124326321948

Epoch 12, Validation Loss: 0.3603886893162361, Validation Accuracy: 0.025034702711301666

Epoch 13, Validation Loss: 0.35983472493091234, Validation Accuracy: 0.0249921771202569

Epoch 14, Validation Loss: 0.35931560885225866, Validation Accuracy:
0.024980882632192107

Epoch 15, Validation Loss: 0.3588241552448746, Validation Accuracy:
0.025038016037254435

Epoch 16, Validation Loss: 0.3583666105424204, Validation Accuracy:
0.02509889230358783

Epoch 17, Validation Loss: 0.35796128498117624, Validation Accuracy:
0.024976787848631124

Epoch 18, Validation Loss: 0.3575696809120273, Validation Accuracy:
0.02501064664925576

Epoch 19, Validation Loss: 0.35719772219362095, Validation Accuracy:
0.02509035966867694

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.366722953600564, Validation Accuracy:
0.026830882579294633

Epoch 1, Validation Loss: 0.3661608811347715, Validation Accuracy:
0.02606621089491169

Epoch 2, Validation Loss: 0.36551062123059636, Validation Accuracy:
0.025673644631617823

Epoch 3, Validation Loss: 0.3648077108280239, Validation Accuracy:
0.025248637497305784

Epoch 4, Validation Loss: 0.36408861665512726, Validation Accuracy:
0.025264378252628394

Epoch 5, Validation Loss: 0.3633670060717438, Validation Accuracy:
0.025189304549465434

Epoch 6, Validation Loss: 0.3626701249821902, Validation Accuracy:
0.025077718612453444

Epoch 7, Validation Loss: 0.3619963667972508, Validation Accuracy:
0.025118138112560865

Epoch 8, Validation Loss: 0.3613541115898057, Validation Accuracy:
0.025074276096694905

Epoch 9, Validation Loss: 0.36074111375856044, Validation Accuracy:
0.02516321600927241

Epoch 10, Validation Loss: 0.3601726734312829, Validation Accuracy:
0.02517962543511552

Epoch 11, Validation Loss: 0.35963575168519696, Validation Accuracy:
0.02516930514959672

Epoch 12, Validation Loss: 0.35915697101623784, Validation Accuracy: 0.025056176316680518

Epoch 13, Validation Loss: 0.35868540472783167, Validation Accuracy: 0.025158233125434547

Epoch 14, Validation Loss: 0.35825657134612204, Validation Accuracy: 0.025153312865969547

Epoch 15, Validation Loss: 0.3578622208043896, Validation Accuracy: 0.02513664846397123

Epoch 16, Validation Loss: 0.3574813832124469, Validation Accuracy: 0.02523090497308139

Epoch 17, Validation Loss: 0.35713833171144016, Validation Accuracy: 0.025223287062828448

Epoch 18, Validation Loss: 0.3568227265963779, Validation Accuracy: 0.025187268560694517

Epoch 19, Validation Loss: 0.3565225681063555, Validation Accuracy: 0.02517323919451792

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34944832753898486, Validation Accuracy: 0.025162847855590705

Epoch 1, Validation Loss: 0.3493714816960744, Validation Accuracy: 0.024969407152953975

Epoch 2, Validation Loss: 0.34932548458463797, Validation Accuracy: 0.025086791523297076

Epoch 3, Validation Loss: 0.3493186111189887, Validation Accuracy: 0.025037060594713542

Epoch 4, Validation Loss: 0.34931259519113206, Validation Accuracy: 0.02501340186882328

Epoch 5, Validation Loss: 0.34930201839868247, Validation Accuracy: 0.025033911038972696

Epoch 6, Validation Loss: 0.3493054822715873, Validation Accuracy: 0.02497876740623661

Epoch 7, Validation Loss: 0.3492933590861763, Validation Accuracy: 0.02502186463673926

Epoch 8, Validation Loss: 0.3492852044904202, Validation Accuracy: 0.025050226178166303

Epoch 9, Validation Loss: 0.34929251027462205, Validation Accuracy: 0.02498589526593835

Epoch 10, Validation Loss: 0.34928244411501636, Validation Accuracy: 0.02504385559966762

Epoch 11, Validation Loss: 0.34927913901527824, Validation Accuracy: 0.025036886875970284

Epoch 12, Validation Loss: 0.34929918658644626, Validation Accuracy: 0.024914437597171695

Epoch 13, Validation Loss: 0.34928169831744493, Validation Accuracy: 0.02500775722575963

Epoch 14, Validation Loss: 0.34927607529216603, Validation Accuracy: 0.025046360775321446

Epoch 15, Validation Loss: 0.3492840728895836, Validation Accuracy: 0.024993909241283804

Epoch 16, Validation Loss: 0.34927686427722204, Validation Accuracy: 0.025023205247206397

Epoch 17, Validation Loss: 0.349280600956001, Validation Accuracy: 0.025011794387922545

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.34942650173793066, Validation Accuracy: 0.0251431122651894

Epoch 1, Validation Loss: 0.3493689366664839, Validation Accuracy: 0.025047457801036375

Epoch 2, Validation Loss: 0.3493521413199659, Validation Accuracy: 0.024957677114861746

Epoch 3, Validation Loss: 0.3493267609079186, Validation Accuracy: 0.02505953114094511

Epoch 4, Validation Loss: 0.3493066496647913, Validation Accuracy: 0.02507913381181287

Epoch 5, Validation Loss: 0.349308499405461, Validation Accuracy: 0.025042717061681898

Epoch 6, Validation Loss: 0.3493006182811396, Validation Accuracy: 0.02504366291460534

Epoch 7, Validation Loss: 0.34930093612327767, Validation Accuracy: 0.024997497940612658

Epoch 8, Validation Loss: 0.34930541963494444, Validation Accuracy: 0.024971273801707158

Epoch 9, Validation Loss: 0.34929373187403523, Validation Accuracy: 0.02499781958474633

Epoch 10, Validation Loss: 0.34928498781348577, Validation Accuracy: 0.025028663180061198

Epoch 11, Validation Loss: 0.34929514382376564, Validation Accuracy: 0.024966791295472846

Epoch 12, Validation Loss: 0.3492922522589823, Validation Accuracy: 0.024982496095282795

Epoch 13, Validation Loss: 0.3492880845188207, Validation Accuracy: 0.0249957023402361

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.34938972692927417, Validation Accuracy: 0.025177078442992416

Epoch 1, Validation Loss: 0.3493390345839649, Validation Accuracy: 0.02520298914996048

Epoch 2, Validation Loss: 0.3493317372301968, Validation Accuracy: 0.025110131028342864

Epoch 3, Validation Loss: 0.34931085770834175, Validation Accuracy: 0.025022006533951657

Epoch 4, Validation Loss: 0.34930584855174307, Validation Accuracy: 0.025035080923417125

Epoch 5, Validation Loss: 0.3493109758083637, Validation Accuracy: 0.02498871378149881

Epoch 6, Validation Loss: 0.34930046889977184, Validation Accuracy: 0.02501802580833883

Epoch 7, Validation Loss: 0.34930293021663544, Validation Accuracy: 0.02498127110208019

Epoch 8, Validation Loss: 0.34930291498269395, Validation Accuracy: 0.0249579972040887

Epoch 9, Validation Loss: 0.34928606653923433, Validation Accuracy: 0.025052036681047867

Epoch 10, Validation Loss: 0.3492888988691287, Validation Accuracy: 0.025038999158439212

Epoch 11, Validation Loss: 0.34929422113499037, Validation Accuracy: 0.024960874361803116

Epoch 12, Validation Loss: 0.3492849065411475, Validation Accuracy: 0.02504277253221086

Epoch 13, Validation Loss: 0.34929217276147223, Validation Accuracy: 0.024979224589878016

Epoch 14, Validation Loss: 0.34927828413972783, Validation Accuracy: 0.025066501129942055

Epoch 15, Validation Loss: 0.34927053952927034, Validation Accuracy: 0.02511622894793559

Epoch 16, Validation Loss: 0.349278548367266, Validation Accuracy: 0.025041749074594246

Epoch 17, Validation Loss: 0.34927289583546944, Validation Accuracy: 0.02507965664267133

Epoch 18, Validation Loss: 0.3492835085681887, Validation Accuracy: 0.024995896004760633

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3493116801932787, Validation Accuracy: 0.024950424947346547

Epoch 1, Validation Loss: 0.34929907262768994, Validation Accuracy: 0.02500679671910827

Epoch 2, Validation Loss: 0.34928007109585235, Validation Accuracy: 0.025112597593130264

Epoch 3, Validation Loss: 0.3492992627561536, Validation Accuracy: 0.024977291039069677

Epoch 4, Validation Loss: 0.3492850653143142, Validation Accuracy: 0.025040725490950603

Epoch 5, Validation Loss: 0.34928148807426246, Validation Accuracy: 0.02504958344772378

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3493359292263429, Validation Accuracy: 0.02512598918186577

Epoch 1, Validation Loss: 0.3493219517892407, Validation Accuracy: 0.024974671369028534

Epoch 2, Validation Loss: 0.3493086782933465, Validation Accuracy: 0.02499987176922564

Epoch 3, Validation Loss: 0.3493069943512048, Validation Accuracy: 0.024950611899325244

Epoch 4, Validation Loss: 0.3493058168266902, Validation Accuracy: 0.024957915913943175

Epoch 5, Validation Loss: 0.3492840971455681, Validation Accuracy: 0.025077219879116257

Epoch 6, Validation Loss: 0.34929641208636847, Validation Accuracy: 0.02498044395429656

Epoch 7, Validation Loss: 0.3492783987640447, Validation Accuracy: 0.025101457603291792

Epoch 8, Validation Loss: 0.34929115046046805, Validation Accuracy: 0.024977865602504715

Epoch 9, Validation Loss: 0.34929215168538813, Validation Accuracy: 0.02498146718344795

Epoch 10, Validation Loss: 0.34927659117554316, Validation Accuracy: 0.025073560912540115

Epoch 11, Validation Loss: 0.34929230698284974, Validation Accuracy: 0.024964408018777175

Epoch 12, Validation Loss: 0.3492812634845525, Validation Accuracy: 0.025028733273130283

Epoch 13, Validation Loss: 0.349286936574775, Validation Accuracy: 0.024988199802988015

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.34937201643700044, Validation Accuracy: 0.024934891657151653

Epoch 1, Validation Loss: 0.3493255327268511, Validation Accuracy: 0.02505041382955251

Epoch 2, Validation Loss: 0.3493106882122551, Validation Accuracy: 0.025044759427694928

Epoch 3, Validation Loss: 0.3493042579359807, Validation Accuracy: 0.02502988604821787

Epoch 4, Validation Loss: 0.34930105392749494, Validation Accuracy: 0.025012510104315024

Epoch 5, Validation Loss: 0.3492940491245639, Validation Accuracy: 0.02504058868338775

Epoch 6, Validation Loss: 0.3492950110074604, Validation Accuracy: 0.025013336342559346

Epoch 7, Validation Loss: 0.349279167264626, Validation Accuracy: 0.02509511361041773

Epoch 8, Validation Loss: 0.3492861451493304, Validation Accuracy: 0.025033225404221038

Epoch 9, Validation Loss: 0.3492820833811985, Validation Accuracy: 0.025054318131097163

Epoch 10, Validation Loss: 0.3492973024584815, Validation Accuracy: 0.024957809478376395

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34931420459049217, Validation Accuracy: 0.025046351264370173

Epoch 1, Validation Loss: 0.34929431497902785, Validation Accuracy: 0.025024565328380075

Epoch 2, Validation Loss: 0.34927805526084993, Validation Accuracy: 0.025037638531597132

Epoch 3, Validation Loss: 0.34928495416570243, Validation Accuracy: 0.024942013218933454

Epoch 4, Validation Loss: 0.34927361101725557, Validation Accuracy: 0.025002051871306632

Epoch 5, Validation Loss: 0.34927830750829825, Validation Accuracy: 0.024984290239429576

Epoch 6, Validation Loss: 0.3492770010129394, Validation Accuracy: 0.024997947833938723

Epoch 7, Validation Loss: 0.3492648859621573, Validation Accuracy: 0.02504838221177292

Epoch 8, Validation Loss: 0.34928674533704374, Validation Accuracy: 0.024919657444478358

Epoch 9, Validation Loss: 0.34926395425133905, Validation Accuracy: 0.025058735418739934

Epoch 10, Validation Loss: 0.3492541384164512, Validation Accuracy: 0.02512478987822561

Epoch 11, Validation Loss: 0.349261383634643, Validation Accuracy: 0.025094588875065733

Epoch 12, Validation Loss: 0.34926542181235093, Validation Accuracy: 0.025051072260832967

Epoch 13, Validation Loss: 0.34928245683461795, Validation Accuracy: 0.024915890584621386

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.34933714579707636, Validation Accuracy: 0.025031937653595744

Epoch 1, Validation Loss: 0.34931813842309617, Validation Accuracy: 0.024902813594549864

Epoch 2, Validation Loss: 0.34929228908666604, Validation Accuracy: 0.024975770349060813

Epoch 3, Validation Loss: 0.3492815657969444, Validation Accuracy: 0.02499826792949575

Epoch 4, Validation Loss: 0.34927414346569524, Validation Accuracy: 0.02505597775765799

Epoch 5, Validation Loss: 0.3492875484467736, Validation Accuracy: 0.024923500729724806

Epoch 6, Validation Loss: 0.3492825935703353, Validation Accuracy: 0.024981525576812547

Epoch 7, Validation Loss: 0.349270278259779, Validation Accuracy: 0.025033046290473687

Epoch 8, Validation Loss: 0.34926915449776663, Validation Accuracy: 0.02504951917649353

Epoch 9, Validation Loss: 0.34926990850391815, Validation Accuracy: 0.025007629750641795

Epoch 10, Validation Loss: 0.34927593729927875, Validation Accuracy: 0.024981150656264908

Epoch 11, Validation Loss: 0.34926857804837946, Validation Accuracy: 0.025029690373649827

Epoch 12, Validation Loss: 0.34928042768840456, Validation Accuracy: 0.024963364651957778

Epoch 13, Validation Loss: 0.3492765743146759, Validation Accuracy: 0.02496992270970092

Epoch 14, Validation Loss: 0.349280685999849, Validation Accuracy: 0.024953118306050882

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3492984183077185, Validation Accuracy: 0.02501102711130715

Epoch 1, Validation Loss: 0.3492844037471279, Validation Accuracy: 0.024968638487053916

Epoch 2, Validation Loss: 0.34926579526577045, Validation Accuracy: 0.02508267250911386

Epoch 3, Validation Loss: 0.3492741502692031, Validation Accuracy:
0.02500519498510771

Epoch 4, Validation Loss: 0.34929322604801755, Validation Accuracy:
0.02487577504316128

Epoch 5, Validation Loss: 0.3492660561655059, Validation Accuracy:
0.025055240607813497

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34928519391540264, Validation Accuracy:
0.024995512245159637

Epoch 1, Validation Loss: 0.3492650793444726, Validation Accuracy:
0.025065834389934653

Epoch 2, Validation Loss: 0.3492742180084768, Validation Accuracy:
0.025004939405680444

Epoch 3, Validation Loss: 0.34926408292637867, Validation Accuracy:
0.0250430848772081

Epoch 4, Validation Loss: 0.3492789498481798, Validation Accuracy:
0.024966254882135875

Epoch 5, Validation Loss: 0.34927597139076916, Validation Accuracy:
0.024996088349437364

Epoch 6, Validation Loss: 0.3492668326528137, Validation Accuracy:
0.025028663180061198

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.34926958452383283, Validation Accuracy:
0.025084015289500012

Epoch 1, Validation Loss: 0.34927646176099186, Validation Accuracy:
0.02498909725250763

Epoch 2, Validation Loss: 0.34927719247252415, Validation Accuracy:
0.024985886579420066

Epoch 3, Validation Loss: 0.34926938529937496, Validation Accuracy:
0.025022634763405806

Epoch 4, Validation Loss: 0.34926726245702644, Validation Accuracy:
0.025037189022826367

Epoch 5, Validation Loss: 0.3492650621878006, Validation Accuracy:
0.025060875321696246

Epoch 6, Validation Loss: 0.3492735301886244, Validation Accuracy: 0.025001475353892497

Epoch 7, Validation Loss: 0.34927113269162235, Validation Accuracy: 0.02500679741646873

Epoch 8, Validation Loss: 0.34926905924865687, Validation Accuracy: 0.025030341752046947

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.34927453045217927, Validation Accuracy: 0.02505563212726475

Epoch 1, Validation Loss: 0.3492838049644868, Validation Accuracy: 0.02495666177722615

Epoch 2, Validation Loss: 0.34927396317273746, Validation Accuracy: 0.025034378014490075

Epoch 3, Validation Loss: 0.34927149083714926, Validation Accuracy: 0.0250282109150595

Epoch 4, Validation Loss: 0.34927102886417666, Validation Accuracy: 0.0250562348191637

Epoch 5, Validation Loss: 0.34926689321882376, Validation Accuracy: 0.025054902202245346

Epoch 6, Validation Loss: 0.34927108891252845, Validation Accuracy: 0.02502045076302502

Epoch 7, Validation Loss: 0.34926573307283465, Validation Accuracy: 0.02505406660389895

Epoch 8, Validation Loss: 0.3492828355385707, Validation Accuracy: 0.0249181287150058

Epoch 9, Validation Loss: 0.34927330966622894, Validation Accuracy: 0.025003526138301556

Epoch 10, Validation Loss: 0.34926245429971375, Validation Accuracy: 0.025060663735654885

Epoch 11, Validation Loss: 0.3492707883749647, Validation Accuracy: 0.025023015122025025

Epoch 12, Validation Loss: 0.34926924767624357, Validation Accuracy: 0.02503444931139868

Epoch 13, Validation Loss: 0.3492899924590629, Validation Accuracy: 0.024893254176871098

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.349299927799045, Validation Accuracy: 0.02496825417185075

Epoch 1, Validation Loss: 0.34927589699588996, Validation Accuracy:
0.025035519560121663

Epoch 2, Validation Loss: 0.3492760781023106, Validation Accuracy:
0.025011799228433062

Epoch 3, Validation Loss: 0.34926803591233624, Validation Accuracy:
0.02504116250083351

Epoch 4, Validation Loss: 0.34927450094566154, Validation Accuracy:
0.024972616057892347

Epoch 5, Validation Loss: 0.3492646218085703, Validation Accuracy:
0.025060991408612936

Epoch 6, Validation Loss: 0.3492792091209894, Validation Accuracy:
0.024947097072063405

Epoch 7, Validation Loss: 0.34926937746055076, Validation Accuracy:
0.02502251102463001

Epoch 8, Validation Loss: 0.3492693134188356, Validation Accuracy:
0.025024059127712266

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3492720833339407, Validation Accuracy:
0.02505228313724484

Epoch 1, Validation Loss: 0.3492702565920856, Validation Accuracy:
0.02503457779169158

Epoch 2, Validation Loss: 0.3492584444453048, Validation Accuracy:
0.025104774216052898

Epoch 3, Validation Loss: 0.3492671910201941, Validation Accuracy:
0.025034891835310536

Epoch 4, Validation Loss: 0.34926134591954516, Validation Accuracy:
0.02506572282281127

Epoch 5, Validation Loss: 0.3492689419620978, Validation Accuracy:
0.025003526500044882

Early stopping due to no improvement.

Tuning GIN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3492698926783673, Validation Accuracy:
0.025044961375548708

Epoch 1, Validation Loss: 0.34927729800084684, Validation Accuracy: 0.024987816451637727

Epoch 2, Validation Loss: 0.3492812245122848, Validation Accuracy: 0.024955670005209256

Epoch 3, Validation Loss: 0.34927037491396107, Validation Accuracy: 0.025018844897519654

Early stopping due to no improvement.

Best parameters for GIN with SMOTE and Focal Loss: {'learning_rate': 0.0001, 'hidden_channels': 16, 'dropout_rate': 0.6, 'heads': 1}

Best validation accuracy for GIN: 0.9750205916540294

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.3494038271992733, Validation Accuracy: 0.03454849618465549

Epoch 1, Validation Loss: 0.34941136940537254, Validation Accuracy: 0.03381179323764135

Epoch 2, Validation Loss: 0.34938877066666674, Validation Accuracy: 0.03350299908154731

Epoch 3, Validation Loss: 0.34938767360102746, Validation Accuracy: 0.032813710252424994

Epoch 4, Validation Loss: 0.34939954165489445, Validation Accuracy: 0.03219954532158491

Epoch 5, Validation Loss: 0.34939562771515575, Validation Accuracy: 0.03190998209696366

Epoch 6, Validation Loss: 0.34939058609399254, Validation Accuracy: 0.031967242555942674

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3538561120222579, Validation Accuracy: 0.8972462845882256

Epoch 1, Validation Loss: 0.3538506108685108, Validation Accuracy: 0.8886936896503084

Epoch 2, Validation Loss: 0.3537284925617, Validation Accuracy: 0.8533430754242937

Epoch 3, Validation Loss: 0.35349060620918465, Validation Accuracy: 0.8171961648361232

Epoch 4, Validation Loss: 0.35318707303137103, Validation Accuracy: 0.7811954283545616

Epoch 5, Validation Loss: 0.3535153785207431, Validation Accuracy: 0.6004658930857464

Epoch 6, Validation Loss: 0.35254293975995726, Validation Accuracy: 0.491787927920532

Epoch 7, Validation Loss: 0.35225467417139567, Validation Accuracy:
0.4424537013286821

Epoch 8, Validation Loss: 0.3516215530429821, Validation Accuracy: 0.3708556273181042

Epoch 9, Validation Loss: 0.35107478610339293, Validation Accuracy:
0.2971696661262851

Epoch 10, Validation Loss: 0.350672937060704, Validation Accuracy:
0.22343622101392563

Epoch 11, Validation Loss: 0.35040908083134786, Validation Accuracy:
0.18353475869993435

Epoch 12, Validation Loss: 0.3501227316134621, Validation Accuracy:
0.1308954641988735

Epoch 13, Validation Loss: 0.3493893247827998, Validation Accuracy:
0.0393887170649392

Epoch 14, Validation Loss: 0.34934721121717033, Validation Accuracy:
0.033833091790537506

Epoch 15, Validation Loss: 0.3493446367550133, Validation Accuracy:
0.03299277489275231

Epoch 16, Validation Loss: 0.3493213627681543, Validation Accuracy:
0.032407763702688976

Epoch 17, Validation Loss: 0.34931090052607044, Validation Accuracy:
0.031530503087377794

Epoch 18, Validation Loss: 0.34928288042693223, Validation Accuracy:
0.03100160817476012

Epoch 19, Validation Loss: 0.3492956058706894, Validation Accuracy:
0.03100339808937616

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3510637432706563, Validation Accuracy: 0.2652289667130055

Epoch 1, Validation Loss: 0.35097164950950566, Validation Accuracy:
0.2568490250867915

Epoch 2, Validation Loss: 0.35091300948382015, Validation Accuracy:
0.2421578160155779

Epoch 3, Validation Loss: 0.35079698090813594, Validation Accuracy:
0.2351309960212508

Epoch 4, Validation Loss: 0.35076650526032555, Validation Accuracy:
0.22867074562922488

Epoch 5, Validation Loss: 0.3507264013917511, Validation Accuracy: 0.2186819472481359

Epoch 6, Validation Loss: 0.35066479570220777, Validation Accuracy: 0.20904690942574491

Epoch 7, Validation Loss: 0.35059229367719985, Validation Accuracy: 0.18992493744787323

Epoch 8, Validation Loss: 0.35061647415752745, Validation Accuracy: 0.18105562339034875

Epoch 9, Validation Loss: 0.35055701985548504, Validation Accuracy: 0.1734197897242407

Epoch 10, Validation Loss: 0.35054315711665096, Validation Accuracy: 0.1657141098125327

Epoch 11, Validation Loss: 0.3505342482189387, Validation Accuracy: 0.15803963627406709

Epoch 12, Validation Loss: 0.350580935072958, Validation Accuracy: 0.15777805717276788

Epoch 13, Validation Loss: 0.3505204265230051, Validation Accuracy: 0.14954333505272369

Epoch 14, Validation Loss: 0.35046555009432523, Validation Accuracy: 0.1394922190719335

Epoch 15, Validation Loss: 0.3503368380791496, Validation Accuracy: 0.12522096988138826

Epoch 16, Validation Loss: 0.35026942574356684, Validation Accuracy: 0.12153561317851722

Epoch 17, Validation Loss: 0.35030576638489147, Validation Accuracy: 0.11916651697503143

Epoch 18, Validation Loss: 0.3502764110233884, Validation Accuracy: 0.11705334670870844

Epoch 19, Validation Loss: 0.3502343967741831, Validation Accuracy: 0.115709918652483

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34943492433273465, Validation Accuracy: 0.0398897365215719

Epoch 1, Validation Loss: 0.3494148206326269, Validation Accuracy: 0.03782968562041043

Epoch 2, Validation Loss: 0.34938000183247453, Validation Accuracy: 0.03566747968105215

Epoch 3, Validation Loss: 0.34933431716474056, Validation Accuracy: 0.033293734589203657

Epoch 4, Validation Loss: 0.3492746272542636, Validation Accuracy: 0.02536608396004444

Epoch 5, Validation Loss: 0.34928102440041287, Validation Accuracy: 0.025285280354650684

Epoch 6, Validation Loss: 0.34929325311414655, Validation Accuracy: 0.025074839739067753

Epoch 7, Validation Loss: 0.3492916896384644, Validation Accuracy: 0.025028800439254806

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3519455241802017, Validation Accuracy: 0.6612681890818056

Epoch 1, Validation Loss: 0.350934183553194, Validation Accuracy: 0.5228763537442899

Epoch 2, Validation Loss: 0.3499193168603457, Validation Accuracy: 0.2777578272891903

Epoch 3, Validation Loss: 0.349394801458709, Validation Accuracy: 0.05018639340939587

Epoch 4, Validation Loss: 0.3493143838481335, Validation Accuracy: 0.03848895590052874

Epoch 5, Validation Loss: 0.34927727115657137, Validation Accuracy: 0.02550465400285295

Epoch 6, Validation Loss: 0.3492742472191898, Validation Accuracy: 0.025272406020243568

Epoch 7, Validation Loss: 0.34926458786498227, Validation Accuracy: 0.025216140176297547

Epoch 8, Validation Loss: 0.34928814205283265, Validation Accuracy: 0.025018284467825752

Epoch 9, Validation Loss: 0.34927380639625244, Validation Accuracy: 0.025077091211345364

Epoch 10, Validation Loss: 0.3492625138304074, Validation Accuracy: 0.02511270825689015

Epoch 11, Validation Loss: 0.3492695085020278, Validation Accuracy: 0.02503458134121711

Epoch 12, Validation Loss: 0.3492629349083818, Validation Accuracy: 0.025099559706334127

Epoch 13, Validation Loss: 0.3492753782284171, Validation Accuracy: 0.024988711465046592

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.35032522086765866, Validation Accuracy: 0.16553589743589744

Epoch 1, Validation Loss: 0.3499618347170335, Validation Accuracy: 0.08685278588764091

Epoch 2, Validation Loss: 0.349800113634791, Validation Accuracy: 0.07552657768110886

Epoch 3, Validation Loss: 0.3497709591246716, Validation Accuracy: 0.06935097788188449

Epoch 4, Validation Loss: 0.3496656956211213, Validation Accuracy: 0.06084029646656798

Epoch 5, Validation Loss: 0.349676191289135, Validation Accuracy: 0.05862930618695291

Epoch 6, Validation Loss: 0.3496255226821521, Validation Accuracy: 0.05514364439609833

Epoch 7, Validation Loss: 0.3496015961501498, Validation Accuracy: 0.05258350864590282

Epoch 8, Validation Loss: 0.34961574426655734, Validation Accuracy: 0.048210758535772

Epoch 9, Validation Loss: 0.3495209385680206, Validation Accuracy: 0.04483024829889226

Epoch 10, Validation Loss: 0.34929070889801894, Validation Accuracy: 0.027871131931225212

Epoch 11, Validation Loss: 0.34928567703841046, Validation Accuracy: 0.02780299416860277

Epoch 12, Validation Loss: 0.3492847085738596, Validation Accuracy: 0.027759749005282074

Epoch 13, Validation Loss: 0.34929840647553095, Validation Accuracy: 0.027524230250229605

Epoch 14, Validation Loss: 0.349282253247041, Validation Accuracy: 0.027555630816123892

Epoch 15, Validation Loss: 0.34928020820132555, Validation Accuracy: 0.027418167453719496

Epoch 16, Validation Loss: 0.34926188213949466, Validation Accuracy: 0.027453997563634033

Epoch 17, Validation Loss: 0.349301642356972, Validation Accuracy: 0.027092837679032367

Epoch 18, Validation Loss: 0.34928061729921006, Validation Accuracy: 0.027035138754213418

Epoch 19, Validation Loss: 0.349293079328892, Validation Accuracy: 0.026803896323729308

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.35006350485917653, Validation Accuracy:
0.35391506797331324

Epoch 1, Validation Loss: 0.34972413864088414, Validation Accuracy:
0.0836649093777658

Epoch 2, Validation Loss: 0.34929451871450723, Validation Accuracy:
0.04126059797596296

Epoch 3, Validation Loss: 0.34927928780503664, Validation Accuracy:
0.03659400209372498

Epoch 4, Validation Loss: 0.3492791797623741, Validation Accuracy:
0.033027979508543664

Epoch 5, Validation Loss: 0.3492746011494999, Validation Accuracy:
0.029962220210263894

Epoch 6, Validation Loss: 0.34927153860960647, Validation Accuracy:
0.028056086515888187

Epoch 7, Validation Loss: 0.3492740193016772, Validation Accuracy:
0.027395643887411086

Epoch 8, Validation Loss: 0.3492788128906089, Validation Accuracy:
0.02660034324678623

Epoch 9, Validation Loss: 0.34927077743019125, Validation Accuracy:
0.026500869511688393

Epoch 10, Validation Loss: 0.34928001348788923, Validation Accuracy:
0.026201802864579994

Epoch 11, Validation Loss: 0.34926079956828515, Validation Accuracy:
0.02592602093166427

Epoch 12, Validation Loss: 0.34927650783257214, Validation Accuracy:
0.025595715923459064

Epoch 13, Validation Loss: 0.34928146063837756, Validation Accuracy:
0.025377285392474306

Epoch 14, Validation Loss: 0.3492916185713879, Validation Accuracy:
0.025233258851265896

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3506897638364702, Validation Accuracy: 0.3240307889672867

Epoch 1, Validation Loss: 0.34972858709969534, Validation Accuracy:
0.10898271508632193

Epoch 2, Validation Loss: 0.3493253167894283, Validation Accuracy: 0.049609821918721875

Epoch 3, Validation Loss: 0.3492856195783497, Validation Accuracy: 0.03898089433396951

Epoch 4, Validation Loss: 0.349278831822109, Validation Accuracy: 0.03781555714014559

Epoch 5, Validation Loss: 0.3492753883597277, Validation Accuracy: 0.03662539620667371

Epoch 6, Validation Loss: 0.3492644854426088, Validation Accuracy: 0.03629208121462767

Epoch 7, Validation Loss: 0.34926555144875576, Validation Accuracy: 0.03593618075105925

Epoch 8, Validation Loss: 0.34926881018110895, Validation Accuracy: 0.03531721085380717

Epoch 9, Validation Loss: 0.3492821301183393, Validation Accuracy: 0.03498553490089868

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3526038142942613, Validation Accuracy: 0.4499169043271302

Epoch 1, Validation Loss: 0.3512785890262121, Validation Accuracy: 0.2526453228127509

Epoch 2, Validation Loss: 0.3503516833332573, Validation Accuracy: 0.13565525625965044

Epoch 3, Validation Loss: 0.349905529034049, Validation Accuracy: 0.09415232129527738

Epoch 4, Validation Loss: 0.3497978690688131, Validation Accuracy: 0.07654048008700871

Epoch 5, Validation Loss: 0.3497218993993906, Validation Accuracy: 0.0650402331882749

Epoch 6, Validation Loss: 0.3495363406005036, Validation Accuracy: 0.047642613728149916

Epoch 7, Validation Loss: 0.34949867763826925, Validation Accuracy: 0.04479319508716486

Epoch 8, Validation Loss: 0.3493497884155207, Validation Accuracy: 0.0342688641718037

Epoch 9, Validation Loss: 0.3493185015973027, Validation Accuracy: 0.030252424195782668

Epoch 10, Validation Loss: 0.349264215372928, Validation Accuracy: 0.026166056980437023

Epoch 11, Validation Loss: 0.3492726765702439, Validation Accuracy: 0.025021663222769712

Epoch 12, Validation Loss: 0.34927475215779347, Validation Accuracy: 0.02502533058010235

Epoch 13, Validation Loss: 0.34927325368519163, Validation Accuracy: 0.025015329907302167

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35657597179744144, Validation Accuracy: 0.04546002560044326

Epoch 1, Validation Loss: 0.3559831471804058, Validation Accuracy: 0.030768125719885384

Epoch 2, Validation Loss: 0.35405012772929284, Validation Accuracy: 0.02672951942263007

Epoch 3, Validation Loss: 0.3522354763731471, Validation Accuracy: 0.02509266741057114

Epoch 4, Validation Loss: 0.35164420532233664, Validation Accuracy: 0.025024239346230204

Epoch 5, Validation Loss: 0.35055634682586706, Validation Accuracy: 0.02501962474410873

Epoch 6, Validation Loss: 0.35037995323945514, Validation Accuracy: 0.024959221986273965

Epoch 7, Validation Loss: 0.3501516990271159, Validation Accuracy: 0.024929931046508348

Epoch 8, Validation Loss: 0.35005405131108114, Validation Accuracy: 0.025084714459045913

Epoch 9, Validation Loss: 0.34990891348339487, Validation Accuracy: 0.02509471761709201

Epoch 10, Validation Loss: 0.34987293564652094, Validation Accuracy: 0.025027510510425777

Epoch 11, Validation Loss: 0.34983157120626557, Validation Accuracy: 0.025011479627829184

Epoch 12, Validation Loss: 0.34978932438062377, Validation Accuracy: 0.02501436280444016

Epoch 13, Validation Loss: 0.34974871949285785, Validation Accuracy: 0.02507203206100211

Epoch 14, Validation Loss: 0.34972310280681546, Validation Accuracy: 0.025035337819290987

Epoch 15, Validation Loss: 0.3497207936814642, Validation Accuracy: 0.025023333572652028

Epoch 16, Validation Loss: 0.34969999861184775, Validation Accuracy: 0.02492983833315376

Epoch 17, Validation Loss: 0.34963925363999737, Validation Accuracy: 0.02501192509501608

Epoch 18, Validation Loss: 0.3496421757466148, Validation Accuracy: 0.02502071166034416

Epoch 19, Validation Loss: 0.3496270117629551, Validation Accuracy: 0.024920599900461266

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3499298962410863, Validation Accuracy: 0.09345933477193244

Epoch 1, Validation Loss: 0.349650602260831, Validation Accuracy: 0.06393491830153392

Epoch 2, Validation Loss: 0.349560509840253, Validation Accuracy: 0.057751944943915334

Epoch 3, Validation Loss: 0.34945410637938357, Validation Accuracy: 0.04715577311864372

Epoch 4, Validation Loss: 0.3494254065210707, Validation Accuracy: 0.04697108465262331

Epoch 5, Validation Loss: 0.3494318956624781, Validation Accuracy: 0.045545849848000926

Epoch 6, Validation Loss: 0.3494056328650444, Validation Accuracy: 0.03948924338147969

Epoch 7, Validation Loss: 0.34938698903502663, Validation Accuracy: 0.038865605490892116

Epoch 8, Validation Loss: 0.34939796117044264, Validation Accuracy: 0.03778338177685537

Epoch 9, Validation Loss: 0.3493690352433964, Validation Accuracy: 0.03641063288020042

Epoch 10, Validation Loss: 0.3493624892335376, Validation Accuracy: 0.03459050922422131

Epoch 11, Validation Loss: 0.34935446567925865, Validation Accuracy: 0.03344909663585345

Epoch 12, Validation Loss: 0.3493503645691032, Validation Accuracy: 0.03299310741100813

Epoch 13, Validation Loss: 0.3493552551080216, Validation Accuracy: 0.032635832959137856

Epoch 14, Validation Loss: 0.34933694709027674, Validation Accuracy: 0.031942071810025084

Epoch 15, Validation Loss: 0.3493527542272809, Validation Accuracy: 0.030920721885356068

Epoch 16, Validation Loss: 0.34934945570919707, Validation Accuracy: 0.03073059876061887

Epoch 17, Validation Loss: 0.3493489171967613, Validation Accuracy: 0.030191573239765363

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35120775230765044, Validation Accuracy: 0.22023536172690958

Epoch 1, Validation Loss: 0.34980176607373337, Validation Accuracy: 0.052705697663680856

Epoch 2, Validation Loss: 0.34977459293737007, Validation Accuracy: 0.05136119877864163

Epoch 3, Validation Loss: 0.34965319683770685, Validation Accuracy: 0.045256575336141136

Epoch 4, Validation Loss: 0.3496590161293967, Validation Accuracy: 0.0447980918428848

Epoch 5, Validation Loss: 0.34962173564262483, Validation Accuracy: 0.043141510619902665

Epoch 6, Validation Loss: 0.3496059483245348, Validation Accuracy: 0.04286619091699339

Epoch 7, Validation Loss: 0.34958004655672364, Validation Accuracy: 0.04107768639141299

Epoch 8, Validation Loss: 0.34952434276232947, Validation Accuracy: 0.03744360632276035

Epoch 9, Validation Loss: 0.34948852377257333, Validation Accuracy: 0.03641223077495261

Epoch 10, Validation Loss: 0.349482650570479, Validation Accuracy: 0.03584657849102681

Epoch 11, Validation Loss: 0.3494597805788736, Validation Accuracy: 0.034057736803492736

Epoch 12, Validation Loss: 0.3494212166695086, Validation Accuracy: 0.03248260455859308

Epoch 13, Validation Loss: 0.34932698150426517, Validation Accuracy: 0.0285196852009563

Epoch 14, Validation Loss: 0.34932262725924734, Validation Accuracy: 0.02746331129360711

Epoch 15, Validation Loss: 0.3493192845183626, Validation Accuracy: 0.024916756024606353

Epoch 16, Validation Loss: 0.34929957793604943, Validation Accuracy: 0.025080742186798555

Epoch 17, Validation Loss: 0.3492898913678105, Validation Accuracy: 0.02508070906018498

Epoch 18, Validation Loss: 0.3492976724361959, Validation Accuracy: 0.02503885472181045

Epoch 19, Validation Loss: 0.34930859923954344, Validation Accuracy: 0.024941135432109532

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34926457618069706, Validation Accuracy: 0.025197690553687445

Epoch 1, Validation Loss: 0.34926503586118335, Validation Accuracy: 0.025113961977615482

Epoch 2, Validation Loss: 0.34927357145337845, Validation Accuracy: 0.02499473930024995

Epoch 3, Validation Loss: 0.34927668228338726, Validation Accuracy: 0.02499442031569469

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3493153476537605, Validation Accuracy: 0.03795549284935548

Epoch 1, Validation Loss: 0.3492798306805916, Validation Accuracy: 0.032780075539817384

Epoch 2, Validation Loss: 0.3492714151111489, Validation Accuracy: 0.027220939183987682

Epoch 3, Validation Loss: 0.3492697425574878, Validation Accuracy: 0.025033871166399803

Epoch 4, Validation Loss: 0.3492771509119654, Validation Accuracy: 0.024999743566072766

Epoch 5, Validation Loss: 0.34926745850158386, Validation Accuracy: 0.025049187729104513

Epoch 6, Validation Loss: 0.3492713825726332, Validation Accuracy: 0.025015965181797897

Epoch 7, Validation Loss: 0.3492723688594165, Validation Accuracy:
0.025023345544849102

Epoch 8, Validation Loss: 0.34927432723435814, Validation Accuracy:
0.024985318592944207

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3496100583827821, Validation Accuracy:
0.046885343487163174

Epoch 1, Validation Loss: 0.3494949635145978, Validation Accuracy: 0.0374381481775997

Epoch 2, Validation Loss: 0.34947874824107433, Validation Accuracy:
0.036069769767972694

Epoch 3, Validation Loss: 0.34943943846018677, Validation Accuracy:
0.03376218983569051

Epoch 4, Validation Loss: 0.3493570953089901, Validation Accuracy:
0.030446473012012337

Epoch 5, Validation Loss: 0.34935608062495666, Validation Accuracy:
0.02999066159040299

Epoch 6, Validation Loss: 0.34933657348895486, Validation Accuracy:
0.029188784241083912

Epoch 7, Validation Loss: 0.34931529233828373, Validation Accuracy:
0.0276173197188484

Epoch 8, Validation Loss: 0.34931651194101526, Validation Accuracy:
0.027169855851742017

Epoch 9, Validation Loss: 0.3492861601614183, Validation Accuracy:
0.02655648287593035

Epoch 10, Validation Loss: 0.34928835843396244, Validation Accuracy:
0.02622655640825707

Epoch 11, Validation Loss: 0.3492777374926631, Validation Accuracy:
0.02538538487188037

Epoch 12, Validation Loss: 0.34927255100115356, Validation Accuracy:
0.02501398504498309

Epoch 13, Validation Loss: 0.34928097692376037, Validation Accuracy:
0.024962788071652208

Epoch 14, Validation Loss: 0.34926784326953275, Validation Accuracy:
0.025055796413637414

Epoch 15, Validation Loss: 0.3492671809628347, Validation Accuracy:
0.025052915143351933

Epoch 16, Validation Loss: 0.34927548390464214, Validation Accuracy: 0.025012120015082684

Epoch 17, Validation Loss: 0.34928201283178023, Validation Accuracy: 0.024943944750304006

Epoch 18, Validation Loss: 0.3492655278583318, Validation Accuracy: 0.02506815902661472

Epoch 19, Validation Loss: 0.3492786030171823, Validation Accuracy: 0.02497800735054616

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3492722531997832, Validation Accuracy: 0.025025777294435694

Epoch 1, Validation Loss: 0.3492677764176731, Validation Accuracy: 0.025062862210648

Epoch 2, Validation Loss: 0.3492786804440595, Validation Accuracy: 0.025031179909360133

Epoch 3, Validation Loss: 0.3492723587281059, Validation Accuracy: 0.02506587843472326

Epoch 4, Validation Loss: 0.3492711474818568, Validation Accuracy: 0.025081449937148868

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.34927461216822453, Validation Accuracy: 0.02503129874394549

Epoch 1, Validation Loss: 0.34926571658172323, Validation Accuracy: 0.025093565752371188

Epoch 2, Validation Loss: 0.34929087159059774, Validation Accuracy: 0.024922821883428325

Epoch 3, Validation Loss: 0.3492755503127948, Validation Accuracy: 0.025020521239482865

Epoch 4, Validation Loss: 0.34927452571930423, Validation Accuracy: 0.02501026483268323

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.34927122683146455, Validation Accuracy: 0.02510043766707543

Epoch 1, Validation Loss: 0.3492715953301555, Validation Accuracy: 0.025048861438706466

Epoch 2, Validation Loss: 0.3492702246451792, Validation Accuracy: 0.025050981800459157

Epoch 3, Validation Loss: 0.3492763520914035, Validation Accuracy: 0.024977673301374504

Epoch 4, Validation Loss: 0.3492695396354713, Validation Accuracy: 0.025039625341752542

Epoch 5, Validation Loss: 0.34928391478197746, Validation Accuracy: 0.02492676144496719

Epoch 6, Validation Loss: 0.349266004251783, Validation Accuracy: 0.025047912502918365

Epoch 7, Validation Loss: 0.3492792992674683, Validation Accuracy: 0.024978066912590875

Epoch 8, Validation Loss: 0.34928384837382487, Validation Accuracy: 0.02495228615990806

Epoch 9, Validation Loss: 0.34926821701875693, Validation Accuracy: 0.025048016390962404

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34926489202615346, Validation Accuracy: 0.02507675379536938

Epoch 1, Validation Loss: 0.34927335588571157, Validation Accuracy: 0.02501173868531856

Epoch 2, Validation Loss: 0.34926530371232895, Validation Accuracy: 0.02505142106801943

Epoch 3, Validation Loss: 0.3492738885560048, Validation Accuracy: 0.024994740919749

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.34928106988038377, Validation Accuracy: 0.02507240316957861

Epoch 1, Validation Loss: 0.3492709038866956, Validation Accuracy: 0.025052218852160347

Epoch 2, Validation Loss: 0.34927580684941106, Validation Accuracy: 0.02502412087122534

Epoch 3, Validation Loss: 0.34927844121201757, Validation Accuracy: 0.02499403743720075

Epoch 4, Validation Loss: 0.3492622844338713, Validation Accuracy: 0.02509735157569838

Epoch 5, Validation Loss: 0.34927528911725464, Validation Accuracy: 0.02498082443390394

Epoch 6, Validation Loss: 0.3492688645352205, Validation Accuracy: 0.025049192776678903

Epoch 7, Validation Loss: 0.3492722271689706, Validation Accuracy: 0.025008206980036522

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.34945846972039557, Validation Accuracy: 0.04649659471314787

Epoch 1, Validation Loss: 0.3494206680257622, Validation Accuracy: 0.042676529960524595

Epoch 2, Validation Loss: 0.3494288754966064, Validation Accuracy: 0.04263909909447708

Epoch 3, Validation Loss: 0.34941250366845145, Validation Accuracy: 0.03984701455208662

Epoch 4, Validation Loss: 0.3493765781890074, Validation Accuracy: 0.03857969290102879

Epoch 5, Validation Loss: 0.3493506398893172, Validation Accuracy: 0.0361885406803538

Epoch 6, Validation Loss: 0.3493874340731808, Validation Accuracy: 0.03856477846038565

Epoch 7, Validation Loss: 0.3493735980307198, Validation Accuracy: 0.037912272555865385

Epoch 8, Validation Loss: 0.34937179739362845, Validation Accuracy: 0.037218903048796124

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3492754371675013, Validation Accuracy: 0.02499679363857894

Epoch 1, Validation Loss: 0.34927475001320946, Validation Accuracy: 0.024995061025202884

Epoch 2, Validation Loss: 0.34927604319735733, Validation Accuracy: 0.025001795737432404

Epoch 3, Validation Loss: 0.3492738069139107, Validation Accuracy: 0.02500064110783434

Epoch 4, Validation Loss: 0.34927190459395757, Validation Accuracy: 0.025014943292449854

Epoch 5, Validation Loss: 0.34926486998870415, Validation Accuracy: 0.025071745302253534

Epoch 6, Validation Loss: 0.3492782437623878, Validation Accuracy: 0.024968369292678358

Epoch 7, Validation Loss: 0.3492756417164436, Validation Accuracy: 0.024984412005450023

Epoch 8, Validation Loss: 0.3492860297855018, Validation Accuracy: 0.02492104743311159

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.349270036439446, Validation Accuracy: 0.02503174501378824

Epoch 1, Validation Loss: 0.34927917473369435, Validation Accuracy: 0.02495670357019153

Epoch 2, Validation Loss: 0.3492718574870609, Validation Accuracy: 0.025011028242559782

Epoch 3, Validation Loss: 0.34926599596925173, Validation Accuracy: 0.02505028013216492

Epoch 4, Validation Loss: 0.3492657625793523, Validation Accuracy: 0.02506270163255048

Epoch 5, Validation Loss: 0.3492697618587437, Validation Accuracy: 0.025022066219184267

Epoch 6, Validation Loss: 0.34928238961300245, Validation Accuracy: 0.024945439064860193

Epoch 7, Validation Loss: 0.3492731173192301, Validation Accuracy: 0.024986214237166418

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3492750067716793, Validation Accuracy: 0.02502995333181108

Epoch 1, Validation Loss: 0.34926913231241496, Validation Accuracy: 0.025029314189093838

Epoch 2, Validation Loss: 0.3492603131914257, Validation Accuracy: 0.025091775715799278

Epoch 3, Validation Loss: 0.3492860652820644, Validation Accuracy: 0.02493072660098522

Epoch 4, Validation Loss: 0.34926942900451774, Validation Accuracy: 0.025032126999761452

Epoch 5, Validation Loss: 0.3492741486422773, Validation Accuracy: 0.024981855391962002

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3492734689570538, Validation Accuracy: 0.02500320685497319

Epoch 1, Validation Loss: 0.3492693236240974, Validation Accuracy: 0.025012703969284625

Epoch 2, Validation Loss: 0.3492841210317967, Validation Accuracy: 0.02493714402996562

Epoch 3, Validation Loss: 0.34927303515947783, Validation Accuracy: 0.02499948708479514

Epoch 4, Validation Loss: 0.34925626954133104, Validation Accuracy: 0.02509261254604973

Epoch 5, Validation Loss: 0.34927600851425755, Validation Accuracy: 0.024966265270416566

Epoch 6, Validation Loss: 0.34926887740272444, Validation Accuracy: 0.02499935872771579

Epoch 7, Validation Loss: 0.34928101389934646, Validation Accuracy: 0.024951956259028248

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.34926796780330666, Validation Accuracy: 0.025053295331816352

Epoch 1, Validation Loss: 0.3492696631339289, Validation Accuracy: 0.025022965087934477

Epoch 2, Validation Loss: 0.3492885130658635, Validation Accuracy: 0.02487107781512174

Epoch 3, Validation Loss: 0.34926313191430447, Validation Accuracy: 0.025085340425586484

Epoch 4, Validation Loss: 0.3492758681549328, Validation Accuracy: 0.02499064164953106

Epoch 5, Validation Loss: 0.34927042786300033, Validation Accuracy: 0.025025076383562207

Epoch 6, Validation Loss: 0.34925111351770444, Validation Accuracy: 0.025149814222671246

Epoch 7, Validation Loss: 0.34927528512389133, Validation Accuracy: 0.02500147489977094

Epoch 8, Validation Loss: 0.3492652716914714, Validation Accuracy: 0.025042378423291847

Epoch 9, Validation Loss: 0.3492663278621125, Validation Accuracy: 0.02503983435068084

Early stopping due to no improvement.

Tuning GCN with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3492739691627824, Validation Accuracy: 0.02501141546654627

Epoch 1, Validation Loss: 0.349262059252552, Validation Accuracy: 0.02507975258747141

Epoch 2, Validation Loss: 0.3492742955093052, Validation Accuracy: 0.025014237413357003

Epoch 3, Validation Loss: 0.34926373838786745, Validation Accuracy: 0.025067171705506926

Epoch 4, Validation Loss: 0.3492747097098206, Validation Accuracy: 0.024997113349156455

Early stopping due to no improvement.

Best parameters for GCN with SMOTE and Focal Loss: {'learning_rate': 0.0001, 'hidden_channels': 16, 'dropout_rate': 0.6, 'heads': 1}

Best validation accuracy for GCN: 0.115709918652483

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.3543586458077206, Validation Accuracy: 0.9065620542082738

Epoch 1, Validation Loss: 0.3543314087035934, Validation Accuracy: 0.9036720773392825

Epoch 2, Validation Loss: 0.3543641853421261, Validation Accuracy: 0.8977041594956384

Epoch 3, Validation Loss: 0.35435849487337817, Validation Accuracy: 0.879026051980833

Epoch 4, Validation Loss: 0.35418912790549306, Validation Accuracy: 0.8559224665445909

Epoch 5, Validation Loss: 0.35417197685383683, Validation Accuracy: 0.8351772976856365

Epoch 6, Validation Loss: 0.3537924755595754, Validation Accuracy: 0.6939810397365263

Epoch 7, Validation Loss: 0.35372984135712937, Validation Accuracy: 0.6189282782680073

Epoch 8, Validation Loss: 0.3530805287674698, Validation Accuracy: 0.49196095283297203

Epoch 9, Validation Loss: 0.3528706436565437, Validation Accuracy: 0.41688793795681295

Epoch 10, Validation Loss: 0.352093166881992, Validation Accuracy: 0.33091242130539406

Epoch 11, Validation Loss: 0.35124445575342583, Validation Accuracy: 0.20143006627136378

Epoch 12, Validation Loss: 0.35122466146502246, Validation Accuracy: 0.1895077391199493

Epoch 13, Validation Loss: 0.35111947524044707, Validation Accuracy: 0.17138465644036396

Epoch 14, Validation Loss: 0.3510180508380492, Validation Accuracy: 0.15414159814247047

Epoch 15, Validation Loss: 0.35098279432090873, Validation Accuracy: 0.1435798374083851

Epoch 16, Validation Loss: 0.3508489690998352, Validation Accuracy: 0.1326619605589871

Epoch 17, Validation Loss: 0.35072900891008213, Validation Accuracy: 0.12251314006487907

Epoch 18, Validation Loss: 0.3505479299992545, Validation Accuracy: 0.10585486820071342

Epoch 19, Validation Loss: 0.35040588887690316, Validation Accuracy: 0.09662806705411552

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.3536818145078702, Validation Accuracy: 0.320195527500866

Epoch 1, Validation Loss: 0.3530570180629087, Validation Accuracy: 0.2795449006545595

Epoch 2, Validation Loss: 0.3527704792342174, Validation Accuracy: 0.26283467111996983

Epoch 3, Validation Loss: 0.35248669235049646, Validation Accuracy:
0.22967891531962265

Epoch 4, Validation Loss: 0.3520990144230296, Validation Accuracy: 0.2058713384291797

Epoch 5, Validation Loss: 0.3518277321648657, Validation Accuracy:
0.18714879625758832

Epoch 6, Validation Loss: 0.35158330372190355, Validation Accuracy:
0.16986025844619296

Epoch 7, Validation Loss: 0.35138052376564916, Validation Accuracy:
0.1519904953015381

Epoch 8, Validation Loss: 0.351251317165034, Validation Accuracy: 0.1407123003600769

Epoch 9, Validation Loss: 0.3510445624811774, Validation Accuracy:
0.12803917645308419

Epoch 10, Validation Loss: 0.3508206910590084, Validation Accuracy:
0.11455901143845353

Epoch 11, Validation Loss: 0.35063472286643227, Validation Accuracy:
0.10172768840574135

Epoch 12, Validation Loss: 0.35049830617443206, Validation Accuracy:
0.09369438674769855

Epoch 13, Validation Loss: 0.35036455298180025, Validation Accuracy:
0.0861586992203529

Epoch 14, Validation Loss: 0.35009531495588886, Validation Accuracy:
0.06793488023567935

Epoch 15, Validation Loss: 0.34986250793963447, Validation Accuracy:
0.05582065964739445

Epoch 16, Validation Loss: 0.3494324366892538, Validation Accuracy:
0.03194291620819579

Epoch 17, Validation Loss: 0.34928858050933254, Validation Accuracy:
0.02579799311882471

Epoch 18, Validation Loss: 0.34927602478351544, Validation Accuracy:
0.025783841612811362

Epoch 19, Validation Loss: 0.3492958769756866, Validation Accuracy:
0.025537775748731062

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.35153847659196213, Validation Accuracy:
0.26736775670003643

Epoch 1, Validation Loss: 0.35142279994990633, Validation Accuracy:
0.25209840439177056

Epoch 2, Validation Loss: 0.351323979442232, Validation Accuracy: 0.22575572969437355

Epoch 3, Validation Loss: 0.35121372061095224, Validation Accuracy: 0.1976179238022923

Epoch 4, Validation Loss: 0.35103093490707077, Validation Accuracy: 0.18369806598523974

Epoch 5, Validation Loss: 0.35050912781921273, Validation Accuracy: 0.11641874522158994

Epoch 6, Validation Loss: 0.35037684891714943, Validation Accuracy: 0.1095506266596539

Epoch 7, Validation Loss: 0.3503659467395423, Validation Accuracy: 0.10568834547213037

Epoch 8, Validation Loss: 0.35032595690367535, Validation Accuracy: 0.09814143943514538

Epoch 9, Validation Loss: 0.3502527798523678, Validation Accuracy: 0.09405195211602144

Epoch 10, Validation Loss: 0.35019443385654286, Validation Accuracy: 0.08666473480001334

Epoch 11, Validation Loss: 0.35012022082326427, Validation Accuracy: 0.0794228732746839

Epoch 12, Validation Loss: 0.34998759974912735, Validation Accuracy: 0.06929120523847157

Epoch 13, Validation Loss: 0.34972839512245235, Validation Accuracy: 0.05407824151477542

Epoch 14, Validation Loss: 0.34952817668689984, Validation Accuracy: 0.041277178653149595

Epoch 15, Validation Loss: 0.34950258536610945, Validation Accuracy: 0.040174551499619036

Epoch 16, Validation Loss: 0.34949019085384775, Validation Accuracy: 0.03926761358533174

Epoch 17, Validation Loss: 0.3494930602332794, Validation Accuracy: 0.037909415531111476

Epoch 18, Validation Loss: 0.3494676856633747, Validation Accuracy: 0.03681842074898396

Epoch 19, Validation Loss: 0.3494771664255014, Validation Accuracy: 0.035884419147245085

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34956573840997945, Validation Accuracy: 0.05347242523553818

Epoch 1, Validation Loss: 0.34951796136777985, Validation Accuracy: 0.04690839763212793

Epoch 2, Validation Loss: 0.34950453427530104, Validation Accuracy: 0.04409614447323192

Epoch 3, Validation Loss: 0.34945286533081205, Validation Accuracy: 0.038750522667747485

Epoch 4, Validation Loss: 0.3494540270297758, Validation Accuracy: 0.03583605926496056

Epoch 5, Validation Loss: 0.3493657878255726, Validation Accuracy: 0.03172432899722184

Epoch 6, Validation Loss: 0.34935264130384097, Validation Accuracy: 0.029194159115863358

Epoch 7, Validation Loss: 0.3493148705947488, Validation Accuracy: 0.02801549433071674

Epoch 8, Validation Loss: 0.34932835152368097, Validation Accuracy: 0.02703826101235683

Epoch 9, Validation Loss: 0.3493030033543447, Validation Accuracy: 0.026256140962656792

Epoch 10, Validation Loss: 0.34930257103579215, Validation Accuracy: 0.026030468938410465

Epoch 11, Validation Loss: 0.34930179846789644, Validation Accuracy: 0.026011078697752703

Epoch 12, Validation Loss: 0.349286032891451, Validation Accuracy: 0.025950771519823505

Epoch 13, Validation Loss: 0.3492931757612205, Validation Accuracy: 0.02582002977259894

Epoch 14, Validation Loss: 0.3492920535521827, Validation Accuracy: 0.025824758005136218

Epoch 15, Validation Loss: 0.3492947912245767, Validation Accuracy: 0.025716982390266173

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3498866982554679, Validation Accuracy: 0.15850383582514485

Epoch 1, Validation Loss: 0.3497940003132406, Validation Accuracy: 0.13834562935448455

Epoch 2, Validation Loss: 0.3497141087173528, Validation Accuracy: 0.12363629832609789

Epoch 3, Validation Loss: 0.3495948526906612, Validation Accuracy: 0.09782801088688059

Epoch 4, Validation Loss: 0.3493187665643526, Validation Accuracy: 0.03140615495961626

Epoch 5, Validation Loss: 0.3493140946990503, Validation Accuracy: 0.029814607721429378

Epoch 6, Validation Loss: 0.34930110251341506, Validation Accuracy: 0.02880786205480858

Epoch 7, Validation Loss: 0.34928814878238934, Validation Accuracy: 0.026697210991852568

Epoch 8, Validation Loss: 0.3492787004848272, Validation Accuracy: 0.026466167727638795

Epoch 9, Validation Loss: 0.34927266281532593, Validation Accuracy: 0.026500325739582744

Epoch 10, Validation Loss: 0.3492911755299154, Validation Accuracy: 0.02625667379563953

Epoch 11, Validation Loss: 0.3492656424826487, Validation Accuracy: 0.02627145373839325

Epoch 12, Validation Loss: 0.34927370892860754, Validation Accuracy: 0.026069631840489854

Epoch 13, Validation Loss: 0.3492880285377834, Validation Accuracy: 0.025409615211896483

Epoch 14, Validation Loss: 0.3492702295999077, Validation Accuracy: 0.025351520219145475

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3528291429982292, Validation Accuracy: 0.7034542199147347

Epoch 1, Validation Loss: 0.3512912740926293, Validation Accuracy: 0.3428590483177165

Epoch 2, Validation Loss: 0.3506530499635796, Validation Accuracy: 0.2537172527731886

Epoch 3, Validation Loss: 0.35041804319575764, Validation Accuracy: 0.2024312259460679

Epoch 4, Validation Loss: 0.35026718213895414, Validation Accuracy: 0.1626190671703071

Epoch 5, Validation Loss: 0.3499877830740832, Validation Accuracy: 0.10923960166434937

Epoch 6, Validation Loss: 0.3499340754436796, Validation Accuracy: 0.09320803689132141

Epoch 7, Validation Loss: 0.34982909428570463, Validation Accuracy: 0.08305915565250867

Epoch 8, Validation Loss: 0.3497693306459091, Validation Accuracy: 0.07749080330619218

Epoch 9, Validation Loss: 0.34966379315326584, Validation Accuracy: 0.04753315132605304

Epoch 10, Validation Loss: 0.3496420601609327, Validation Accuracy: 0.04571523841280427

Epoch 11, Validation Loss: 0.3496000863630186, Validation Accuracy: 0.04323610149054619

Epoch 12, Validation Loss: 0.34958120004710724, Validation Accuracy: 0.04103182442052874

Epoch 13, Validation Loss: 0.34953203346238243, Validation Accuracy: 0.039299113627148566

Epoch 14, Validation Loss: 0.34951315047427384, Validation Accuracy: 0.03850870171982104

Epoch 15, Validation Loss: 0.34948855830777076, Validation Accuracy: 0.037415035781157825

Epoch 16, Validation Loss: 0.34947255054123644, Validation Accuracy: 0.036488977421596

Epoch 17, Validation Loss: 0.3494727422226747, Validation Accuracy: 0.036355703836776596

Epoch 18, Validation Loss: 0.34944041365429424, Validation Accuracy: 0.035225450580463086

Epoch 19, Validation Loss: 0.3494370028043799, Validation Accuracy: 0.03479213207929477

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3516576570405558, Validation Accuracy: 0.504246036733155

Epoch 1, Validation Loss: 0.3514869899371126, Validation Accuracy: 0.3311661154543845

Epoch 2, Validation Loss: 0.35022223742664893, Validation Accuracy: 0.1399776782850765

Epoch 3, Validation Loss: 0.34950898635771965, Validation Accuracy: 0.06884913765467718

Epoch 4, Validation Loss: 0.349365364085356, Validation Accuracy: 0.051227263749483776

Epoch 5, Validation Loss: 0.3492973443887961, Validation Accuracy: 0.03590603940762859

Epoch 6, Validation Loss: 0.3492912398674352, Validation Accuracy: 0.032060113032614246

Epoch 7, Validation Loss: 0.3493023206371232, Validation Accuracy: 0.029980938013910375

Epoch 8, Validation Loss: 0.349286361456509, Validation Accuracy: 0.02890391353192537

Epoch 9, Validation Loss: 0.3492691268400282, Validation Accuracy: 0.027615921214608125

Epoch 10, Validation Loss: 0.3492811887199175, Validation Accuracy: 0.02552918537524054

Epoch 11, Validation Loss: 0.3492762726678446, Validation Accuracy: 0.02508343615883269

Epoch 12, Validation Loss: 0.3492691322384638, Validation Accuracy: 0.025110214633220575

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3537101032716169, Validation Accuracy: 0.6154821195349566

Epoch 1, Validation Loss: 0.35339613018497346, Validation Accuracy: 0.5689447780066119

Epoch 2, Validation Loss: 0.35252075618313206, Validation Accuracy: 0.4436905681092354

Epoch 3, Validation Loss: 0.3513391558496887, Validation Accuracy: 0.28465305263913937

Epoch 4, Validation Loss: 0.34996810030404746, Validation Accuracy: 0.10798193118768325

Epoch 5, Validation Loss: 0.34955597685525197, Validation Accuracy: 0.06146663075127307

Epoch 6, Validation Loss: 0.34950695514087343, Validation Accuracy: 0.05051303301423253

Epoch 7, Validation Loss: 0.3493375810736758, Validation Accuracy: 0.03493751170613183

Epoch 8, Validation Loss: 0.34930897742583794, Validation Accuracy: 0.030101046368485842

Epoch 9, Validation Loss: 0.34928929761384914, Validation Accuracy: 0.028819840730434337

Epoch 10, Validation Loss: 0.34929147140855527, Validation Accuracy: 0.027001993590746867

Epoch 11, Validation Loss: 0.34926598421101535, Validation Accuracy: 0.02631464184843813

Epoch 12, Validation Loss: 0.34927719971973903, Validation Accuracy: 0.026102820428606618

Epoch 13, Validation Loss: 0.34929414770147643, Validation Accuracy: 0.02545880735733117

Epoch 14, Validation Loss: 0.34929358781715186, Validation Accuracy: 0.02521745598937024

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.0001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3509022606809441, Validation Accuracy: 0.25770894018914653

Epoch 1, Validation Loss: 0.3503819885236158, Validation Accuracy: 0.16818507182385645

Epoch 2, Validation Loss: 0.34957191584719616, Validation Accuracy: 0.04821541190887602

Epoch 3, Validation Loss: 0.34930515777384374, Validation Accuracy: 0.029848870697636247

Epoch 4, Validation Loss: 0.3492860713460605, Validation Accuracy: 0.025933649872640383

Epoch 5, Validation Loss: 0.3492889654251837, Validation Accuracy: 0.025586009183141824

Epoch 6, Validation Loss: 0.3492934768903936, Validation Accuracy: 0.025449723779577643

Epoch 7, Validation Loss: 0.34931274538596274, Validation Accuracy: 0.025265691310572744

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.35196355332807633, Validation Accuracy: 0.4041602504876296

Epoch 1, Validation Loss: 0.34931999592863894, Validation Accuracy: 0.030603342092297585

Epoch 2, Validation Loss: 0.34926460738809173, Validation Accuracy: 0.025093375472007882

Epoch 3, Validation Loss: 0.3492621069510581, Validation Accuracy: 0.025074124611422884

Epoch 4, Validation Loss: 0.3492636858825352, Validation Accuracy:
0.025076262728627834

Epoch 5, Validation Loss: 0.34926572271967055, Validation Accuracy:
0.02504303389608757

Epoch 6, Validation Loss: 0.3492833731635924, Validation Accuracy:
0.024928623282277282

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.34964797314875773, Validation Accuracy:
0.05544754068085281

Epoch 1, Validation Loss: 0.34928175444638465, Validation Accuracy:
0.02591879683810697

Epoch 2, Validation Loss: 0.34929383348294585, Validation Accuracy:
0.025477739704051643

Epoch 3, Validation Loss: 0.34929522457844564, Validation Accuracy:
0.02519837757544505

Epoch 4, Validation Loss: 0.34929516586121495, Validation Accuracy:
0.025099471792595862

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.3495063187170857, Validation Accuracy:
0.025139055932668464

Epoch 1, Validation Loss: 0.34943994118025523, Validation Accuracy:
0.025063550246377443

Epoch 2, Validation Loss: 0.3493767859918012, Validation Accuracy:
0.025083963594410973

Epoch 3, Validation Loss: 0.3493507484496379, Validation Accuracy:
0.02517849082926429

Epoch 4, Validation Loss: 0.3493531718295502, Validation Accuracy:
0.02500410576449335

Epoch 5, Validation Loss: 0.3493423266682968, Validation Accuracy:
0.02493671567835407

Epoch 6, Validation Loss: 0.3493029020412388, Validation Accuracy:
0.025099695652397058

Epoch 7, Validation Loss: 0.34930337828678765, Validation Accuracy:
0.024926434180719215

Epoch 8, Validation Loss: 0.34927500336992534, Validation Accuracy: 0.02508969765670482

Epoch 9, Validation Loss: 0.34928563784428923, Validation Accuracy: 0.025038171856756098

Epoch 10, Validation Loss: 0.3492802462122281, Validation Accuracy: 0.025076833879764598

Epoch 11, Validation Loss: 0.3492812943961425, Validation Accuracy: 0.02503803554431237

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.3493093586441305, Validation Accuracy: 0.03392739849747527

Epoch 1, Validation Loss: 0.3492961762560804, Validation Accuracy: 0.030164449371766443

Epoch 2, Validation Loss: 0.3492830514759935, Validation Accuracy: 0.026523851193393674

Epoch 3, Validation Loss: 0.3492806192958917, Validation Accuracy: 0.026196425731042163

Epoch 4, Validation Loss: 0.3492816046213098, Validation Accuracy: 0.025762680550459185

Epoch 5, Validation Loss: 0.3492766864246529, Validation Accuracy: 0.025441146660576872

Epoch 6, Validation Loss: 0.34927776041752645, Validation Accuracy: 0.02532743026876728

Epoch 7, Validation Loss: 0.34928285114226804, Validation Accuracy: 0.025267441770953348

Epoch 8, Validation Loss: 0.3492584178228828, Validation Accuracy: 0.025319703594227888

Epoch 9, Validation Loss: 0.34927377370983437, Validation Accuracy: 0.025207001631388323

Epoch 10, Validation Loss: 0.3492746778368654, Validation Accuracy: 0.025169610690862064

Epoch 11, Validation Loss: 0.3492833267962075, Validation Accuracy: 0.025081346293996283

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3543167012205195, Validation Accuracy: 0.8472025568415005

Epoch 1, Validation Loss: 0.3530298185999281, Validation Accuracy: 0.5674342484974566

Epoch 2, Validation Loss: 0.3499548951390363, Validation Accuracy:
0.13451460905297016

Epoch 3, Validation Loss: 0.3493954093373443, Validation Accuracy:
0.04654085147087863

Epoch 4, Validation Loss: 0.34928329728968976, Validation Accuracy:
0.027504926715112697

Epoch 5, Validation Loss: 0.34927230762784595, Validation Accuracy:
0.025284365722672536

Epoch 6, Validation Loss: 0.34927180949275016, Validation Accuracy:
0.02505847233335385

Epoch 7, Validation Loss: 0.349268987146264, Validation Accuracy:
0.025081514280070497

Epoch 8, Validation Loss: 0.3492767014367409, Validation Accuracy:
0.025025081531012575

Epoch 9, Validation Loss: 0.3492595325628522, Validation Accuracy:
0.02512714896498306

Epoch 10, Validation Loss: 0.34926036754553724, Validation Accuracy:
0.025087610378815475

Epoch 11, Validation Loss: 0.349274531191691, Validation Accuracy:
0.02498633960386134

Epoch 12, Validation Loss: 0.34926697034989634, Validation Accuracy:
0.025042665948082278

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.3494293783645772, Validation Accuracy:
0.06443230875385725

Epoch 1, Validation Loss: 0.3492790856964831, Validation Accuracy:
0.03018949214873172

Epoch 2, Validation Loss: 0.34927874345045823, Validation Accuracy:
0.028061865933197518

Epoch 3, Validation Loss: 0.3492733741516511, Validation Accuracy:
0.026930143285297862

Epoch 4, Validation Loss: 0.34929566133406853, Validation Accuracy:
0.02656009111593939

Epoch 5, Validation Loss: 0.3492774616547909, Validation Accuracy:
0.026473290592806658

Epoch 6, Validation Loss: 0.34927962406101654, Validation Accuracy:
0.02636912152524807

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.3493376045161974, Validation Accuracy:
0.029805827235501185

Epoch 1, Validation Loss: 0.34927402166811466, Validation Accuracy:
0.025182199108621954

Epoch 2, Validation Loss: 0.3492786385137449, Validation Accuracy:
0.025007763596559894

Epoch 3, Validation Loss: 0.3492684368755918, Validation Accuracy:
0.025053412911946283

Epoch 4, Validation Loss: 0.34927895073559384, Validation Accuracy:
0.024969541519717857

Epoch 5, Validation Loss: 0.3492671570026549, Validation Accuracy:
0.025046796071694147

Epoch 6, Validation Loss: 0.34928422848284985, Validation Accuracy:
0.024935915364660177

Epoch 7, Validation Loss: 0.34928110508114174, Validation Accuracy:
0.024959469720289767

Epoch 8, Validation Loss: 0.34927700448864446, Validation Accuracy:
0.02497966890458367

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.3493996910362622, Validation Accuracy:
0.04457598949463447

Epoch 1, Validation Loss: 0.3492704198023226, Validation Accuracy:
0.025215062864529632

Epoch 2, Validation Loss: 0.34926714472676035, Validation Accuracy:
0.025156926170950125

Epoch 3, Validation Loss: 0.3492813297448028, Validation Accuracy:
0.025010521561502377

Epoch 4, Validation Loss: 0.34927520562638126, Validation Accuracy:
0.024993650247961022

Epoch 5, Validation Loss: 0.34928721041596555, Validation Accuracy:
0.024903654212273762

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.001, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3492867768402431, Validation Accuracy:
0.024936204044471232

Epoch 1, Validation Loss: 0.3492749484981556, Validation Accuracy:
0.025024113446067968

Epoch 2, Validation Loss: 0.3492844018243974, Validation Accuracy:
0.024942013218933454

Epoch 3, Validation Loss: 0.34927800778419743, Validation Accuracy:
0.02498890379785157

Epoch 4, Validation Loss: 0.3492628952705535, Validation Accuracy:
0.025084761411373672

Epoch 5, Validation Loss: 0.3492885741495317, Validation Accuracy:
0.024925365088573608

Epoch 6, Validation Loss: 0.3492738153443443, Validation Accuracy:
0.025014237413357003

Epoch 7, Validation Loss: 0.34927010462242675, Validation Accuracy:
0.02502219462505196

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.3

Epoch 0, Validation Loss: 0.34946307613891053, Validation Accuracy:
0.02501494635988782

Epoch 1, Validation Loss: 0.34933932994494665, Validation Accuracy:
0.025021809411402474

Epoch 2, Validation Loss: 0.3493260057185483, Validation Accuracy:
0.02502552839938219

Epoch 3, Validation Loss: 0.3492728621876861, Validation Accuracy:
0.025056947608200455

Epoch 4, Validation Loss: 0.3492688318488024, Validation Accuracy:
0.025180059241158743

Epoch 5, Validation Loss: 0.34927399016491534, Validation Accuracy:
0.025144854273265214

Epoch 6, Validation Loss: 0.3492648404821864, Validation Accuracy:
0.02504707711410877

Epoch 7, Validation Loss: 0.3492723033386779, Validation Accuracy:
0.02500243638471284

Epoch 8, Validation Loss: 0.349274721911764, Validation Accuracy:
0.024984931067649888

Epoch 9, Validation Loss: 0.34927336091439126, Validation Accuracy:
0.024998397045434145

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.5

Epoch 0, Validation Loss: 0.34927743806436695, Validation Accuracy:
0.026020731422649632

Epoch 1, Validation Loss: 0.34927393780748545, Validation Accuracy:
0.024997305495249974

Epoch 2, Validation Loss: 0.34926210036940375, Validation Accuracy:
0.02507593326082049

Epoch 3, Validation Loss: 0.3492598039636541, Validation Accuracy:
0.025091563817672587

Epoch 4, Validation Loss: 0.3492723610205922, Validation Accuracy:
0.025003013801930374

Epoch 5, Validation Loss: 0.34926704526243374, Validation Accuracy:
0.025052025998886347

Epoch 6, Validation Loss: 0.34926070993946445, Validation Accuracy:
0.02507453656585751

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=16, dropout=0.6

Epoch 0, Validation Loss: 0.34931879836335666, Validation Accuracy:
0.025322658019696825

Epoch 1, Validation Loss: 0.3492734007001219, Validation Accuracy:
0.025620761412593045

Epoch 2, Validation Loss: 0.34927134226924433, Validation Accuracy:
0.02516976959565718

Epoch 3, Validation Loss: 0.3492832626805412, Validation Accuracy:
0.02492314955942502

Epoch 4, Validation Loss: 0.34927183027302955, Validation Accuracy:
0.024985506354116966

Epoch 5, Validation Loss: 0.3492516811669021, Validation Accuracy:
0.025130175952252153

Epoch 6, Validation Loss: 0.34927700345332807, Validation Accuracy: 0.024958253281381862

Epoch 7, Validation Loss: 0.349279057299233, Validation Accuracy: 0.024963067074296734

Epoch 8, Validation Loss: 0.34926808353689115, Validation Accuracy: 0.025024113446067968

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.3

Epoch 0, Validation Loss: 0.34927691042275344, Validation Accuracy: 0.02499615207018624

Epoch 1, Validation Loss: 0.3492643965532999, Validation Accuracy: 0.025050783814839134

Epoch 2, Validation Loss: 0.3492740533931675, Validation Accuracy: 0.02499563954979634

Epoch 3, Validation Loss: 0.34927361796866574, Validation Accuracy: 0.024981325612019375

Epoch 4, Validation Loss: 0.3492620122935577, Validation Accuracy: 0.025073689557246974

Epoch 5, Validation Loss: 0.3492638908012333, Validation Accuracy: 0.025050200416990437

Epoch 6, Validation Loss: 0.34926265211909935, Validation Accuracy: 0.02506412229403919

Epoch 7, Validation Loss: 0.3492762529968328, Validation Accuracy: 0.02498332392631741

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.5

Epoch 0, Validation Loss: 0.3492597268325815, Validation Accuracy: 0.02509448921937664

Epoch 1, Validation Loss: 0.3492673662844722, Validation Accuracy: 0.02503854550678683

Epoch 2, Validation Loss: 0.349289765281062, Validation Accuracy: 0.02485984425714249

Epoch 3, Validation Loss: 0.34927199843799506, Validation Accuracy: 0.02501584174164236

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=32, dropout=0.6

Epoch 0, Validation Loss: 0.34927232034744754, Validation Accuracy: 0.025566294054714177

Epoch 1, Validation Loss: 0.34928071484080614, Validation Accuracy: 0.024946084352024948

Epoch 2, Validation Loss: 0.34927063374306366, Validation Accuracy: 0.02502033078247217

Epoch 3, Validation Loss: 0.34927652055217373, Validation Accuracy: 0.024962731660256428

Epoch 4, Validation Loss: 0.34928380585190083, Validation Accuracy: 0.024944276154297982

Epoch 5, Validation Loss: 0.34925866962662405, Validation Accuracy: 0.025098238378117723

Epoch 6, Validation Loss: 0.34927504130687664, Validation Accuracy: 0.02496505200518128

Epoch 7, Validation Loss: 0.34928214172867333, Validation Accuracy: 0.024945678245901177

Epoch 8, Validation Loss: 0.3492814506549693, Validation Accuracy: 0.02491905731921946

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.3

Epoch 0, Validation Loss: 0.34928625393150464, Validation Accuracy: 0.02492340536906552

Epoch 1, Validation Loss: 0.3492734798278761, Validation Accuracy: 0.02497800283718508

Epoch 2, Validation Loss: 0.34927107804170615, Validation Accuracy: 0.025014170336420456

Epoch 3, Validation Loss: 0.3492753546379932, Validation Accuracy: 0.02497262729270463

Epoch 4, Validation Loss: 0.3492715672287101, Validation Accuracy: 0.024998781360719792

Epoch 5, Validation Loss: 0.3492610595066553, Validation Accuracy: 0.025073137462533878

Epoch 6, Validation Loss: 0.34927457608005247, Validation Accuracy: 0.024966582084918705

Epoch 7, Validation Loss: 0.3492590483305768, Validation Accuracy: 0.025079970141060403

Epoch 8, Validation Loss: 0.3492669497175193, Validation Accuracy:
0.025040271692847543

Epoch 9, Validation Loss: 0.3492704090794026, Validation Accuracy:
0.02501160676039286

Epoch 10, Validation Loss: 0.3492774602497186, Validation Accuracy:
0.02495916216403347

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.5

Epoch 0, Validation Loss: 0.34927359252946255, Validation Accuracy:
0.02500846353498774

Epoch 1, Validation Loss: 0.3492815745231827, Validation Accuracy:
0.024944596064268566

Epoch 2, Validation Loss: 0.34927208222467315, Validation Accuracy:
0.025003656255532494

Epoch 3, Validation Loss: 0.3492827856215295, Validation Accuracy:
0.02492637023202356

Epoch 4, Validation Loss: 0.3492708368129825, Validation Accuracy:
0.024992496864073958

Epoch 5, Validation Loss: 0.34926857575589315, Validation Accuracy:
0.025030332412459246

Epoch 6, Validation Loss: 0.3492835300140286, Validation Accuracy:
0.024937783821227903

Epoch 7, Validation Loss: 0.3492781919965673, Validation Accuracy:
0.02495972169487003

Epoch 8, Validation Loss: 0.34927377023412925, Validation Accuracy:
0.024983394838679895

Early stopping due to no improvement.

Tuning GAT with SMOTE and Focal Loss, lr=0.01, hidden_channels=64, dropout=0.6

Epoch 0, Validation Loss: 0.3492837948331762, Validation Accuracy:
0.024927336953872753

Epoch 1, Validation Loss: 0.34927736093329437, Validation Accuracy:
0.024982741762880803

Epoch 2, Validation Loss: 0.34927891546088474, Validation Accuracy:
0.024952355058058855

Epoch 3, Validation Loss: 0.34927367054794917, Validation Accuracy:
0.025004552110768883

Epoch 4, Validation Loss: 0.3492642465063715, Validation Accuracy: 0.025069309266796437

Epoch 5, Validation Loss: 0.34927177407013865, Validation Accuracy: 0.025023283738329266

Epoch 6, Validation Loss: 0.34927401767475136, Validation Accuracy: 0.024973134068053522

Epoch 7, Validation Loss: 0.3492620013487842, Validation Accuracy: 0.02507327355202999

Epoch 8, Validation Loss: 0.3492950388870523, Validation Accuracy: 0.024852863454206797

Epoch 9, Validation Loss: 0.3492707011865327, Validation Accuracy: 0.025018143026025945

Epoch 10, Validation Loss: 0.34927696655169316, Validation Accuracy: 0.02497639863727784

Early stopping due to no improvement.

Best parameters for GAT with SMOTE and Focal Loss: {'learning_rate': 0.0001, 'hidden_channels': 16, 'dropout_rate': 0.3, 'heads': 8}

Best validation accuracy for GAT: 0.09662806705411552

Evaluating GIN model with SMOTE and Focal Loss and the best hyperparameters...

Test Loss: 0.35546025071783044, Test Accuracy: 0.138072123294857

Precision: 0.0248, F1 Score: 0.0482, Recall: 0.8850

Evaluating GCN model with SMOTE and Focal Loss and the best hyperparameters...

Test Loss: 0.3561051491620227, Test Accuracy: 0.8537345301307226

Precision: 0.0145, F1 Score: 0.0242, Recall: 0.0734

Evaluating GAT model with SMOTE and Focal Loss and the best hyperparameters...

Test Loss: 0.3508386579399961, Test Accuracy: 0.1764636639771945

Precision: 0.0231, F1 Score: 0.0449, Recall: 0.7851