```json
{
  "18hYnsRvytGnUuQzbBpwjj4YzxpVKHwURR": {
    "gpt-4-turbo": [
      {
        "feature": "High number of transaction nodes",
        "reason": "The graph has a significant number of transaction nodes (8) compared to the address nodes (1), indicating active transactional behavior which is crucial in analyzing the flow of values within the network." High
      },
      {
        "feature": "Large in_degree and out_degree in transaction nodes",
        "reason": "Some transactions, like n1 and n2, have a very high in_degree and out_degree, indicating that these transactions are central points for the flow of values, possibly aggregating inputs from multiple sources and redistributing them. This can be important for understanding potential hubs or key transactions in the network." High
      }
    ],
    "gpt-4o": [
      {
        "feature": "High In-Degree and Out-Degree Nodes",
        "reason": "The address node n0 has both high in-degree and out-degree (4 each), which is relatively uncommon in many reference graphs where address nodes typically have either high in-degree or high out-degree but not both. This characteristic of having multiple inbound and outbound connections is indicative of a node acting as an intermediary or aggregator, which is a typical feature seen in complex networks such as exchanges or tumblers." High
      },
      {
        "feature": "High Transaction Volume with Multiple Outputs",
        "reason": "The transactions originating from n0 have a high number of outputs (e.g., n1 with 12 out_nodes, n2 with 18 out_nodes). This pattern is often seen in money laundering schemes where funds are split into many smaller transactions to obfuscate the trail. This behavior is less common in simpler transactions seen in other reference graphs like darknet markets or gambling, which tend to have fewer outputs." High
      }
    ]
  },
```

"1165byVp4MqcQZ1RrX2nedpqZPmgWsfqMG": {

  "gpt-4-turbo": [

    {

      "feature": "High in-degree on certain nodes",

      "reason": "The transaction node n1 has a significantly high in-degree (300), indicating that it aggregates a lot of transactions from numerous address nodes. This pattern is often seen in nodes that act as central points in a transaction network, possibly serving as a mixing service or a payment gateway which consolidates many inputs." **High**

    },

    {

      "feature": "Significant out-value discrepancy from in-value on transaction nodes",

      "reason": "The transaction node n1 shows a small but noticeable difference between the input value (0.26844477) and the output value (0.26754385). This discrepancy could indicate transaction fees or, in a more complex financial system, might suggest value siphoning or redistribution which could be crucial for understanding economic interactions within the network." **Average (invalid)**

    }

  ],

  "gpt-4o": [

    {

      "feature": "High In-Degree and Out-Degree in Transactions",

      "reason": "The transactions in the graph exhibit high in-degrees and out-degrees, particularly n1 with an in-degree of 300 and n3 with an out-degree of 10. This pattern is similar to those found in graphs like graph 2660 and graph 3370, which are characteristic of 'tumbler' services, where funds are mixed from multiple sources and then redistributed." **High**

    },

    {

      "feature": "Value Distribution Across Multiple Addresses",

      "reason": "The value distribution across multiple addresses is notable, with many addresses having small, specific amounts (e.g., n45, n140, n285). This is indicative of 'tumbler' services, which split and merge transactions to obscure the original source and destination of funds. This pattern aligns with value distributions seen in graphs like graph 2660 and graph 3370." **Average (invalid)**

    }

  ]

},

"bc1qahfhsrnpmpz25th9vmpasvx4rk2yr7f206d9g5": {

```
"gpt-4-turbo": [

    {

        "feature": "Transaction Volume",

        "reason": "Transaction nodes like n1 have a high in_value and out_value, indicating
substantial transactional activity. This is a critical feature as it shows the graph's purpose may be to
handle significant financial transactions, reflecting its importance in possibly large-scale financial
operations or systems." High

    },

    {

        "feature": "Address Connectivity",

        "reason": "Addresses such as n16 show extremely high connectivity, with large in_degree
and out_degree. This suggests that n16 is a central node in financial transactions, possibly acting as a
major hub or intermediary. This high connectivity is vital as it highlights critical nodes that manage or
influence the flow of transactions throughout the network, indicating points of control or
vulnerability." High

    }

],

"gpt-4o": [

    {

        "feature": "High In-Degree and Out-Degree Transactions",

        "reason": "The query graph shows transactions with very high in-degree and out-degree,
such as n1 with an in-degree of 5 and out-degree of 50, and n2 with an in-degree of 2 and out-
degree of 43. These high in-degree and out-degree transactions are significant because they can
indicate complex and high-volume transaction activities. This pattern is uncommon in typical
transactions and can be associated with specific behaviors like money laundering or exchanges, as
observed in reference graphs such as graph 303 (tumbler) and graph 304 (exchange)." Low

    },

    {

        "feature": "Address Nodes with Extremely High Transaction Volume",

        "reason": "One of the address nodes, n16, has an in-degree of 980 and an out-degree of
1596, with in_value and out_value significantly higher than other nodes. Such nodes with extremely
high transaction volumes are critical to identify because they could be hubs in a network of illicit
activities. This is similar to reference graph 304 (exchange) where address nodes handle large
transaction volumes, indicating they play a central role in the network's transaction flow." High

    }

]

},
```

"125JiLazN8aK7mmFW4Ewz67pFkwqUrTBrD": {

  "gpt-4-turbo": [

    {

      "feature": "High in_degree and out_degree in Layer 1 transaction node",

      "reason": "The transaction node n1 in Layer 1 shows a significantly high in_degree of 300, indicating that it aggregates inputs from a large number of nodes, which is characteristic of a mixing or consolidation service. This is important as it suggests the graph could represent financial transactions involving aggregation of funds, which is critical for understanding the flow and purpose of transactions within this blockchain network." **Low**

    },

    {

      "feature": "Significant value difference between in_value and out_value at Layer 1",

      "reason": "The transaction node n1 also shows a non-trivial difference between the in_value and out_value (0.40400015 vs. 0.40309923). This discrepancy in transaction values may indicate transaction fees or the nature of transaction splits, which is essential for financial auditing and understanding economic interactions on the blockchain." **Average (invalid)**

    }

  ],

  "gpt-4o": [

    {

      "feature": "High In-degree Transaction Nodes",

      "reason": "The transaction nodes n1, n298, n299, n301, n302, n303, n305, n306, and n308 have an extremely high in-degree of 300, which is not commonly observed in many of the reference graphs. This suggests a high level of aggregation of inputs which can be indicative of tumbling or mixing services often associated with money laundering." **High**

    },

    {

      "feature": "Dispersed Out-degree Address Nodes",

      "reason": "The address nodes in Layer 2 and Layer 3 have a pattern of low-value transactions with dispersed out-degrees, such as n3, n4, n5, and n18. This behavior is consistent with transaction patterns seen in money laundering and tumbling, where funds are broken down into smaller amounts and sent to multiple addresses to obscure transaction origins." **Low**

    }

  ]

},

"bc1q4w090gzj7m9hy39l8e48gzz4uvdfn2x9y9g70h": {

```
    "gpt-4-turbo": [

       {

          "feature": "High out_degree in transaction nodes",

          "reason": "A noticeable feature in this graph is the significant out_degree in some
transaction nodes. For instance, n1 has an out_degree of 600. This signifies a high level of
transactions being processed by a single node, which is crucial for understanding the flow of values
and the node's centrality within the network. Such nodes could be pivotal in the network's structure,
influencing the distribution and movement of values significantly." High

       },

       {

          "feature": "Value discrepancy between in_value and out_value in transactions",

          "reason": "The transaction node n1 shows a discrepancy between the total incoming value
(in_value: 27.69691553) and the outgoing value (out_value: 27.69184153). This discrepancy,
although small, is crucial as it points to fees or transaction costs within the network. Understanding
these discrepancies is essential for analyzing transaction efficiency and cost within the network,
providing insights into the operational aspects of the blockchain system." Average (invalid)

       }

    ],

    "gpt-4o": [

       {

          "feature": "High Out-Degree Transactions",

          "reason": "The transaction node n1 has an extremely high out-degree of 600, meaning it
distributes funds to 600 different address nodes. This is a significant indicator of behavior typically
seen in tumblers or mixing services, which are designed to obfuscate the source of funds by splitting
and distributing to numerous addresses." High

       },

       {

          "feature": "Large Volume of Transactions",

          "reason": "The transaction node n1 also handles a substantial volume of in_value and
out_value (27.69691553). Handling large volumes of transactions is another characteristic often
associated with tumblers or mixing services, which process high volumes to mix and anonymize the
funds." High

       }

    ]

  },

  "18HW3xaUf2cn3XcBzbEjx1qmqYJ19ug3ym": {
```

```
    "gpt-4-turbo": [

      {

          "feature": "High in-degree and out-degree of nodes",

          "reason": "The nodes within the graph, especially in Layer 1 and Layer 2, show a high
degree of connectivity. This suggests a complex and highly interconnected structure, which is
important for understanding the flow and distribution of values through the network. For instance,
nodes like n1 in Layer 1 and n4 in Layer 2, with high in-degrees and out-degrees, act as central hubs,
indicating their significant role in the network's transactions." Low

      },

      {

          "feature": "Significant in_value and out_value differences in transactions",

          "reason": "In Layer 1, transactions show a notable difference between the input values
(in_value) and the output values (out_value), such as in n1 and n6 transactions. This discrepancy
might suggest transaction fees or value fragmentation across multiple outputs, which is crucial for
financial analysis or tracing the flow of value within the network, indicating potential areas for fraud
analysis or optimization of transaction processes." Low

      }

    ],

    "gpt-4o": [

      {

          "feature": "High In-Degree and Out-Degree of Address Nodes",

          "reason": "The address node n0 has an in-degree and out-degree of 18, which is relatively
high compared to nodes in other reference graphs. Additionally, address nodes like n38, n39, n40,
and n41 also exhibit high in-degree and out-degree values, indicating a high level of interaction. This
characteristic is significant because it suggests a high level of connectivity and activity, which can be
indicative of certain behaviors such as money laundering or market activities." High

      },

      {

          "feature": "Large Number of Transactions with High In-Degree",

          "reason": "There are multiple transaction nodes with a very high in-degree, such as n1 with
149 in-degrees and n6 with 136 in-degrees. This pattern is often seen in graphs related to activities
involving large volumes of small transactions, such as mixing (tumblers) or market activities (darknet
markets). The high in-degree indicates that funds are being collected from a large number of sources,
which can be a mechanism to obscure the origin of the funds." High

      }

    ]

    },
```

  "122j7Su1ckHeEcGFbhZrq7tn4jvEj2dTN2": {

    "gpt-4-turbo": [

      {

        "feature": "High in-degree in transaction nodes",

        "reason": "The transaction node n1 in Layer 1 has a significantly high in-degree of 300, indicating it aggregates inputs from a large number of addresses. This is a critical feature as it suggests that n1 acts as a central hub in transaction activities, potentially centralizing the flow of transactions from many sources to a single point before distributing to others. This pattern is somewhat unusual and could be indicative of batching processes or a consolidation point within a larger transaction network." **High**

      },

      {

        "feature": "Out-value less than in-value for transaction nodes",

        "reason": "For transaction node n1, the total input value (in-value) is slightly higher than the output value (out-value). This discrepancy could signify transaction fees or represent some form of value extraction occurring at this node. In blockchain networks, transaction fees are essential for network security and processing transactions, making this a significant aspect of the transaction's nature and the flow of value across the network." **Average (invalid)**

      }

    ],

    "gpt-4o": [

      {

        "feature": "High In-Degree Transaction Nodes",

        "reason": "The node n1 has an in-degree of 300, which is significantly high. This is a characteristic often seen in graphs related to large-scale operations like pools or exchanges, where a single transaction collects inputs from numerous addresses. This structure is indicative of centralized accumulation of funds." **High**

      },

      {

        "feature": "High Out-Degree Address Nodes",

        "reason": "The node n289 has a high out-degree, with numerous transactions (up to 1460) linked to it. This suggests frequent distribution of funds from a single address, a pattern common in pools or tumblers, where collected funds are redistributed to multiple addresses. This high activity level and fund distribution are key indicators of such operations." **High**

      }

    ]

        },

    "18hZbdGvUpHJumd3SZwUs6hG3vPUB3GFNV": {

        "gpt-4-turbo": [

            {

                "feature": "High out_value at n3 address",

                "reason": "The address node n3 stands out due to its extremely high out_value compared to its in_value. This indicates that it aggregates or collects small amounts from various transactions and then redistributes or sends out a significantly larger amount. This pattern is often seen in distribution centers or hubs within financial networks, making it a key node for understanding money flow in the network." **High**

            },

            {

                "feature": "Large number of out_transactions at n3",

                "reason": "n3 not only has a high out_value but also a high number of outgoing transactions (2937 transactions), which is significantly higher than any other nodes in the transaction layers. This suggests that n3 functions as a major redistribution node, interacting with many other nodes, which highlights its central role in the transaction network and its importance in the flow of value across the network." **High**

            }

        ],

        "gpt-4o": [

            {

                "feature": "Out-degree of n3",

                "reason": "The out-degree of node n3 is 2937, which is significantly higher than typical address nodes in the reference graphs. This high out-degree suggests a large number of transactions stemming from a single address, which is characteristic of behaviors like tumbling or mixing services aimed at obfuscating transaction origins." **High**

            },

            {

                "feature": "High-value transactions",

                "reason": "There are multiple high-value transactions (e.g., n899 with 4638.18609315, n1330 with 3337.40502038, n1607 with 2457.66996051, and so forth) associated with node n3. This pattern of high-value transactions is uncommon in legitimate financial activities and often indicative of money laundering or other illicit financial activities." **High**

            }

        ]

```
  },
  "32Bu1FhSs8FHqGptcB1uphFJcAgcgTvShV": {
    "gpt-4-turbo": [
      {
        "feature": "High in and out degrees of address node n3",

        "reason": "Node n3 in Layer 2 shows significantly high in-degrees and out-degrees
```
compared to other nodes in the graph, indicating it as a central hub for transactions. This suggests
heavy transaction activity, making it a key node in analyzing the overall flow of value within this
network structure." **High**
```
      },
      {
        "feature": "High value transactions associated with n3",

        "reason": "The transactions associated with node n3 involve significantly higher values
```
compared to others. This not only underscores its importance in terms of connectivity but also
highlights its role in high-value transactions within the network, which could be crucial for
understanding financial behaviors or identifying anomalies." **High**
```
      }
    ],
    "gpt-4o": [
      {
        "feature": "High In-Degree and Out-Degree of Address Node n3",

        "reason": "The address node n3 has a significantly high in-degree (2273) and out-degree
```
(1696) with substantial in-value (195.894) and out-value (172.262). This suggests that n3 is a highly
central node in terms of transaction volume, which is a characteristic commonly seen in exchange
nodes or pool nodes. This feature is important because it indicates that n3 acts as a major
intermediary in the transaction network, facilitating numerous transactions." **High**
```
      },
      {
        "feature": "High Transaction Volume and Diversity",

        "reason": "The graph has a notable number of transaction nodes (2981) with varying in-
```
degree, out-degree, and transaction values, such as n1531 (0.998 in-value and 0.998 out-value) and
n1858 (186.930 in-value and 186.928 out-value). The diversity in transaction sizes and the high
volume of transactions are significant because they indicate a complex and active transaction
network. This feature is often associated with exchanges or pools where there is a high rate of
transaction processing." **Average (inaccurate)**
```
      }
```

```
    ]
  },
  "18kD2gAtiqNumFRG4326M3CqFWkUzMhpDb": {
    "gpt-4-turbo": [
      {
        "feature": "Multiple Layers",
        "reason": "The graph consists of multiple layers indicating different types of nodes (address
```
and transaction nodes), which suggests complex interactions and transactions involving multiple parties. This structure is essential for understanding the flow of values and the relationships between entities within the network." **Average (invalid)**

```
      },
      {
        "feature": "In-degree and Out-degree Variations",
        "reason": "The significant variations in in-degree and out-degree across different nodes
```
highlight key nodes that either receive a lot of input (high in-degree) or distribute output to many others (high out-degree). These nodes can be critical in analyzing the flow of transactions, potential bottlenecks, or influential entities within the network." **Average (invalid)**

```
      }
    ],
    "gpt-4o": [
      {
        "feature": "High In-Degree and Out-Degree for Transaction Nodes",
        "reason": "The transaction nodes have a high in-degree and out-degree, indicating a large
```
number of inputs and outputs. For instance, node n46 has an in-degree of 113 and an out-degree of 2, with in_value of 119.75587003 and out_value of 119.75398584. This feature suggests a high level of transaction activity, which is uncommon in most reference graphs, indicating that the graph could be related to activities with a high volume of transactions such as exchanges or tumblers." **Average (inaccurate)**

```
      },
      {
        "feature": "Significant Value Transfers",
        "reason": "The graph exhibits significant value transfers. For example, transaction n46
```
involves a transfer of 119.75587003 units. In comparison to reference graphs like 'ponzi' and 'darknet market', the large value transfers and the number of high-value transactions (e.g., n46, n47) suggest this graph could be related to activities involving large amounts of capital, such as money laundering or exchanges." **High**

```
        }
      ]
    },
    "34FzwBKhYwQqZYG1mCMGETDXvkMcxMpsDc": {
      "gpt-4-turbo": [
        {
          "feature": "High out-degree in transaction nodes",
          "reason": "The transaction node n1 in Layer 1 has an exceptionally high out-degree of 592,
indicating it is dispersing value to a large number of different addresses. This is indicative of a
distribution or mixing pattern, which is significant because it suggests a deliberate attempt to spread
assets across many accounts, potentially for reasons such as anonymity, money laundering, or
spreading risk." High
        },
        {
          "feature": "Large value transactions",
          "reason": "The input value to the transaction node n1 is significantly high (25.74509467)
compared to many standard transactions seen in typical financial or commercial operations. This
high value being split into many smaller transactions could indicate activities like splitting large sums
into smaller amounts to evade detection or limits on transactions, a common feature in complex
financial networks designed to obscure the flow of funds." High
        }
      ],
      "gpt-4o": [
        {
          "feature": "High Out-Degree Transaction Nodes",
          "reason": "The graph contains numerous transaction nodes with extremely high out-
degrees. For instance, node n1 has an out-degree of 592, and many other transaction nodes in Layer
3 exhibit out-degrees ranging from 200 to 600. This pattern is indicative of a behavior where funds
are dispersed to a large number of addresses. This structure is particularly reflective of 'tumbler' or
'mixing service' behaviors, which are designed to obfuscate the trail of cryptocurrency transactions
by breaking the connection between source and destination addresses." High
        },
        {
          "feature": "Significant Transaction Values",
          "reason": "Many transaction nodes in Layer 3 handle significant amounts of cryptocurrency,
often in the range of 10 to 25 units per transaction, with some transactions even reaching values of
```

around 50 units (e.g., n2411 with 56.92957834). The presence of multiple high-value transactions is another characteristic feature of tumblers or mixing services, which are used to launder large amounts of cryptocurrency by splitting them into smaller transactions and dispersing them across multiple addresses." **High**

```
      }

    ]

  },

  "1DJvAKPhh2C3EoCBGbV2NZxL42fgJiJjus": {

    "gpt-4-turbo": [

      {

        "feature": "Transaction volume",
```

"reason": "The transactions in Layer 1 have significant in_values and out_values relative to the values in the address nodes. This indicates a high volume of cryptocurrency moving through these transactions, suggesting that the transactions and their structure are critical for understanding the flow of value through the graph." **Low**

```
      },

      {

        "feature": "Connectivity of nodes",
```

"reason": "The address and transaction nodes in Layer 1 and Layer 2 show varying degrees of connectivity, with some nodes having multiple input and output connections. This connectivity suggests important junction points for the movement of cryptocurrency, highlighting these nodes as key components in the transaction network within the graph." **Average (invalid)**

```
      }

    ],

    "gpt-4o": [

      {

        "feature": "High In-Degree and Out-Degree Transactions",
```

"reason": "The graph contains several transaction nodes with high in-degree and out-degree. For example, n1 has an in-degree of 18 and an out-degree of 4, indicating a high level of interaction with multiple nodes. This pattern is consistent with graphs such as graph 303 and 3360, which are associated with complex financial activities like money laundering and tumbling. The presence of such nodes suggests a potential for significant transaction mixing and redistribution, which is a key characteristic in identifying suspicious financial activities." **Average (inaccurate)**

```
      },

      {

        "feature": "Large Volume of Transactions and Addresses",
```

            "reason": "The graph has a substantial number of transaction nodes (302) and address nodes (2405), which is comparable to graphs like graph 304 and 3426 that are related to expansive financial networks. This high volume indicates a potential for large-scale operations, which could be indicative of activities such as darknet markets or large-scale money laundering. The high volume of transactions and addresses, combined with the complex transaction paths, points to an intricate financial structure designed to obscure the origin and destination of funds." **Average (inaccurate)**

        }

    ]

  },

  "12uLgUi9A2fBuFVtC4pWjjkeAdeU6fVQrU": {

    "gpt-4-turbo": [

      {

        "feature": "High volume of transactions and connections",

        "reason": "The graph demonstrates a high volume of transactions and connections, especially from node n38. This node acts as a central hub, connecting to a significant number of other nodes and handling substantial transaction values, indicating a central point of activity and possibly a point of interest for further analysis in understanding the flow of transactions within the network." **High**

      },

      {

        "feature": "Value of transactions",

        "reason": "The value associated with the transactions, particularly those involving node n38, is notably high. This suggests that not only does n38 have many connections, but it also handles large sums, potentially pinpointing a key player or a critical point in the financial structure of the network. This could be crucial for tasks like fraud detection, network optimization, or forensics analysis." **High**

      }

    ],

    "gpt-4o": [

      {

        "feature": "High In-Degree and Out-Degree of Address Node",

        "reason": "The address node (n0) has an in-degree and out-degree of 10, which is significantly higher compared to most reference graphs where address nodes typically have lower degrees. This suggests that the address is highly connected, indicating it may be a central point in the network, which is typical in cases like exchange nodes or tumbler services." **High**

      },

      {

      "feature": "Large Number of Transactions involving High Values",

      "reason": "There are multiple transactions involving the address node (n0) with very high values (e.g., n14, n20, n307, n352). For instance, n14 has an in-value of 64.91383784, and n20 has an in-value of 47.74016612. This pattern is indicative of large-scale operations, which is characteristic of exchanges or darknet markets where significant amounts of cryptocurrency are moved frequently." **Average (inaccurate)**

      }

    ]

  },

  "17ECwJMCKHdZb3AfHQjWvBbvLY3DDcCg48": {

    "gpt-4-turbo": [

      {

        "feature": "Transaction Values",

        "reason": "This graph has transactions with significant monetary values, indicating high-value transfers which could suggest a larger economic activity or transactions of importance within the system." **Average (invalid)**

      },

      {

        "feature": "Complex Transaction Connections",

        "reason": "The structure of transactions, where a single transaction can involve multiple nodes with various input and output connections, highlights a complex interaction pattern. This complexity can be crucial for understanding systemic behaviors such as money flow, laundering traces, or critical nodes within the network." **Average (invalid)**

      }

    ],

    "gpt-4o": [

      {

        "feature": "High Transaction Involvement of Address Nodes",

        "reason": "The address nodes have high in-degree and out-degree values, indicating a significant level of transaction activity. For example, address nodes like n19 have an in-degree and out-degree of 15, and n21 has an in-degree of 32 and an out-degree of 29. This is indicative of complex and potentially suspicious behavior, often seen in cases of money laundering or tumbling operations." **High**

      },

      {

        "feature": "Large Number of Transactions with High Values",

   "reason": "The graph has multiple high-value transactions. For instance, transaction nodes n151 and n152 have extremely high in-values and out-values (300.0 and 286.877 respectively). Such large and frequent transactions are characteristic of money laundering or darknet market activities, as seen in reference graphs like graph 2318 and graph 3611, which also exhibit high-value transactions and complex structures." **High**

  }

 ]

 },

 "34MfKPYVicpXfG5TcemiL8D5Jhi94yiqDD": {

  "gpt-4-turbo": [

  {

   "feature": "High in-degree of a single transaction node",

   "reason": "The transaction node 'n1' in Layer 1 has an exceptionally high in-degree of 516, which is significantly higher than other nodes. This indicates that 'n1' is a central point in the transaction flow, potentially processing inputs from various sources, making it a crucial node within this graph structure." **High**

  },

  {

   "feature": "Disproportionate transaction output values in Layer 4",

   "reason": "The address node 'n4' in Layer 2 outputs to a striking number of 2582 transactions, which is abnormally high compared to other nodes. This suggests that 'n4' acts as a major distribution or funnel point, disseminating values to a vast number of recipients, highlighting its importance in the scale and scope of transactions within the network." **High**

  }

 ],

  "gpt-4o": [

  {

   "feature": "High Out-degree of Address Node",

   "reason": "The address node n4 at Layer 2 has an exceptionally high out-degree of 2582. This is a significant characteristic that stands out when compared to the reference graphs. Such a high out-degree suggests that this address is involved in a large number of transactions, potentially indicating a tumbling or mixing service, which aims to obfuscate the flow of funds." **High**

  },

  {

   "feature": "Numerous Transactions with High Out-degree",

        "reason": "The transactions at Layer 3, such as n423, n449, n487, etc., exhibit high out-degrees, indicating that each transaction is distributing funds to a large number of addresses. This pattern is characteristic of tumbling or mixing services where a single transaction is used to distribute funds to multiple outputs, enhancing the obfuscation of the transaction trail." **High**

      }

    ]

  },

  "bc1q8snget0xn0w7cfrn2utl3n4awmzqk7prt3ctt8": {

    "gpt-4-turbo": [

      {

        "feature": "High transaction volume from a single node",

        "reason": "The transaction node n1 has a very high out-degree, distributing value to 171 different addresses. This indicates a central role in redistributing incoming funds to a large number of addresses, which is a key characteristic in networks involved in payments or fund distribution systems." **High**

      },

      {

        "feature": "Significant value difference between input and output in transactions",

        "reason": "The transaction n1 shows a notable difference between the total input value and the total output value. Although the absolute difference might seem small, such discrepancies are important in financial networks as they can indicate transaction fees, fund aggregation, or redistribution strategies." **Low**

      }

    ],

    "gpt-4o": [

      {

        "feature": "High Out-Degree in Transaction Nodes at Layer 1",

        "reason": "The graph has transaction nodes at Layer 1 with extremely high out-degrees, such as n1 with 171 out nodes. This is a characteristic often seen in Ponzi schemes, where a single entity distributes funds to a large number of recipients to create the illusion of profitability. This structure is consistent with known Ponzi schemes in the reference graphs (e.g., graph 303 and graph 304), where high out-degree transactions are used to attract more participants." **High**

      },

      {

        "feature": "Large Number of Transaction Nodes in Layer 3",

         "reason": "Layer 3 contains a massive number of transaction nodes (2823 nodes), many of which have high out-degrees and significant transaction amounts. This is indicative of complex money flow typical in money laundering or large-scale fraud operations. Compared to reference graphs like graph 304 and graph 3611, the high number of transactions and the substantial values involved suggest sophisticated financial maneuvers aimed at obfuscating the source and destination of funds." **High**

       }

    ]

  },

  "13UAhC3xM8NxNKFBFTaoXM72KFksgdvVMs": {

    "gpt-4-turbo": [

      {

         "feature": "High in-degree and out-degree of n5 node",

         "reason": "The node n5 in Layer 2 shows a significantly high in-degree and out-degree with substantial transaction volumes compared to other nodes. This suggests that it acts as a major hub in the transaction network, processing a large number of transactions, which could indicate a central point in the flow of value within the network." **High**

      },

      {

         "feature": "Large transaction values in Layer 3",

         "reason": "Transactions in Layer 3, especially those linked to the n5 node, exhibit large values, indicating high-value transfers. This is critical as it highlights areas of the network where significant financial activities are concentrated, potentially pinpointing critical transactions for monitoring or further analysis in financial or security contexts." **High**

      }

    ],

    "gpt-4o": [

      {

         "feature": "High Transaction Volume",

         "reason": "The analyzed graph shows an exceptionally high number of transaction nodes (2892) in Layer 3, with multiple transactions having very high in and out values (e.g., n122, n132, n141, n169, etc.). This is significantly higher than the typical number of transactions in the reference graphs, indicating a likely money laundering or tumbling activity where large volumes of transactions are used to obscure the origin of funds." **High**

      },

      {

"feature": "High In-Degree and Out-Degree of Address Node n5",

"reason": "Address node n5 has an extraordinarily high in-degree (2611) and out-degree (2696), with in_value and out_value totaling in the tens of thousands. This is much higher compared to the reference graphs, suggesting that n5 might be acting as a central node in a tumbling or mixing service, where it receives and then redistributes large amounts of cryptocurrency to obfuscate transaction trails." **High**

        }

    ]

},

    "128EeNfo9chd4L9k4vdKAYxa48TEAvfG6L": {

    "gpt-4-turbo": [

        {

            "feature": "High in-degree and out-degree of address nodes",

            "reason": "The address nodes such as n3, n4, and n5, which have high in-degrees and out-degrees compared to other nodes, suggest that these nodes are central or hubs in the transaction network. This centrality indicates that they are crucial for the flow of transactions within the network, potentially acting as major transactional platforms or wallets." **High**

        },

        {

            "feature": "Large in_value and out_value differences for some address nodes",

            "reason": "Nodes like n3 show a substantial difference between the total incoming value (in_value) and the total outgoing value (out_value), suggesting significant transaction volume processing or accumulation of value. This discrepancy can highlight nodes that are either accumulating wealth, possibly indicating savings or investment behaviors, or are central redistribution points that collect and then distribute transactions, possibly indicating an exchange or a payment service." **High**

        }

    ],

    "gpt-4o": [

        {

            "feature": "High in_value and out_value of address nodes",

            "reason": "The in_value and out_value of the address nodes, particularly n3 and n5, are extremely high compared to other reference graphs. For instance, n3 has an in_value of 4604.915520190002 and an out_value of 2418.0606951. Such high values suggest that this graph is likely involved in large-scale transactions, similar to patterns seen in ponzi and money laundering activities." **High**

        },

```
        {

            "feature": "High in_value of transaction nodes",

            "reason": "Numerous transaction nodes have high in_value, such as n111 with 62.07248031,
n147 with 126.75501797, and n250 with 5.26312317. This indicates substantial amounts are being
moved in single transactions, which is a common characteristic in ponzi schemes and money
laundering operations. The consistency of high in_values across many transaction nodes further
supports this." High

        }

    ]

  },

  "bc1qahe54yxl33clnwdtleuh4cw0fw4df62t0tnuk2": {

    "gpt-4-turbo": [

      {

          "feature": "High in-degree and out-degree of transactions",

          "reason": "Transactions like n1 and n2 have high in-degrees and out-degrees, indicating
that they are central points for the flow of values within the network. This suggests that these nodes
are significant in redistributing the values across many different nodes, which is characteristic of
mixing or laundering services in cryptocurrency networks." Average(inaccurate)

      },

      {

          "feature": "Significant value differences",

          "reason": "The in_value and out_value of certain transactions show significant volume and
discrepancies, such as in n1 and n2. This could indicate complex operations such as aggregation or
splitting of funds, often seen in financial strategies to obfuscate the source or destination of funds,
common in money laundering activities." Low

      }

    ],

    "gpt-4o": [

      {

          "feature": "High in_degree and out_degree of addresses in Layer 2",

          "reason": "The addresses in Layer 2 have exceptionally high in_degree and out_degree
values, indicating a large number of transactions. For example, address n14 has an in_degree of 198
and out_degree of 188. This is similar to patterns observed in reference graphs like graph 1018 and
graph 304, which are associated with illicit activities such as money laundering and ponzi schemes."
High

      },
```

```
    {

        "feature": "High in_value and out_value in transactions",

        "reason": "The transactions in this graph involve significant amounts of value. For instance,
transaction n1 has an in_value of 77.29740945 and out_value of 77.29452845. This is comparable to
certain transactions in reference graphs like graph 304 and graph 1018, where large sums of money
are often moved in a single step, typically indicative of money laundering or similar activities." High

    }

  ]

},

"123qb6ykfRFhAonQGKkaRYLryaYz52NEe2": {

  "gpt-4-turbo": [

    {

        "feature": "High in_degree and out_degree of transaction node n1",

        "reason": "This node acts as a central hub in the transaction graph, indicating a pivotal
point in the flow of value through the network. Its high degree suggests it is a key node for the
aggregation and redistribution of transactions, which is crucial for understanding the graph's overall
structure and dynamics." Low

    },

    {

        "feature": "Large number of address nodes linked to a single transaction",

        "reason": "The transaction node n1 is linked to a wide array of address nodes (300 in total),
indicating a complex interaction pattern and possibly pointing towards batch processing or
consolidation activities within the network. This feature is important as it highlights the scale of
operations and the interconnected nature of addresses involved in the transactions." High

    }

  ],

  "gpt-4o": [

    {

        "feature": "High In-degree and Out-degree of n225",

        "reason": "Node n225 has an exceptionally high in-degree and out-degree of 1177, which is
significantly higher than most nodes found in reference graphs. This indicates that n225 is a highly
connected node, likely serving as a central hub for transactions. Such a structure is reminiscent of
nodes found in money laundering or pool activities, where funds are commonly aggregated and
redistributed." High

    },

    {
```

"feature": "High Transaction Values with Multiple Out-degrees",

"reason": "Several transactions (e.g., n2, n1018, n1032) have very high in-values and out-values, often exceeding 80 units, and involve multiple out-degrees. The presence of such high-value transactions with numerous out-degrees is indicative of activities like large-scale fund redistribution or tumbling, where funds are split and mixed to obfuscate their origin. This pattern is less common in benign activities and more aligned with money laundering or tumbling operations." **Average(inaccurate)**

```
        }

    ]

},
    "18HU9zQvoSZiKhvgnKS1CodCBTYLa6nc9d": {

    "gpt-4-turbo": [

        {
```

"feature": "High in_degree and out_degree of n2",

"reason": "The address node n2 in Layer 2 shows an extremely high in_degree and out_degree of 2999, which significantly stands out compared to other nodes. This suggests that n2 is a central hub in this network, indicating possible aggregation or distribution of transactions through this node, making it crucial for the flow of transactions in the network." **High**

```
        },

        {
```

"feature": "Large number of transactions associated with n2",

"reason": "Layer 3 contains 2998 transaction nodes, with most transactions linked directly to n2, either as inputs or outputs. This not only reinforces the central role of n2 within this graph but also highlights the extensive activity and connectivity, suggesting that this node could be a major point of interaction within the network, potentially impacting the network's functionality and security." **Average(invalid)**

```
        }

    ],

    "gpt-4o": [

        {
```

"feature": "High In-Degree and Out-Degree of Address Node (n2)",

"reason": "The address node n2 has an extremely high in-degree and out-degree of 2999, which is a characteristic often observed in nodes participating in large volumes of transactions. This behavior is typically seen in entities such as exchanges or mixing services, as noted in reference graphs like graph 304 and graph 303, which also exhibit high in-degree and out-degree values in certain nodes." **High**

```
        },
```

```
        {

            "feature": "Repetitive Transaction Patterns",

            "reason": "The graph shows a significant number of repetitive transactions with very similar
in-values and out-values, particularly involving the address node n2. This pattern of transactions
with minute variations in values is indicative of the behavior seen in tumblers or mixers, which aim
to obfuscate the origin of funds by breaking down and reassembling transactions. This behavior is
observable in reference graphs such as graph 3014 and graph 1822, which also demonstrate
repetitive low-value transactions." High

        }

    ]

},

"34MkaxJicUztbrP8W4n8VUr96ezNSouL7X": {

    "gpt-4-turbo": [

        {

            "feature": "High Out-Degree of Node n6",

            "reason": "Node n6 is unique in its remarkably high out-degree compared to its in-degree,
facilitating a significant amount of transaction volume outward. This suggests it could be acting as a
distribution hub within this network, pushing out transactions to a large number of other nodes,
making it a key node in the transaction flow of the network." High

        },

        {

            "feature": "Transaction Volume Handled by Node n6",

            "reason": "Node n6 not only has high connectivity but also handles a significant transaction
volume, as indicated by the total output value. The node's role in processing and distributing
substantial financial amounts underscores its critical financial position in the network's structure and
functionality." High

        }

    ],

    "gpt-4o": [

        {

            "feature": "Address n6 with high out_degree and considerable out_value",

            "reason": "The graph contains an address node n6 with an unusually high out_degree (2963)
and a significant out_value (36.816280880000065). This is similar to patterns observed in reference
graphs like graph 304 and graph 1018, where high out_degree and significant out_values are typical
of nodes involved in darknet markets or money laundering. Such nodes often act as distribution
points or mixers, dispersing large amounts of cryptocurrency to many smaller transactions." High
```

        },

        {

            "feature": "Large number of transaction nodes in Layer 3",

            "reason": "The graph has 2991 transaction nodes in Layer 3, which is significantly high. This is akin to reference graphs such as graph 303 and graph 783, where the large number of transactions often indicates complex activities like tumbling or mixing services typically associated with money laundering or darknet activities. The sheer volume of transactions suggests a high level of activity meant to obfuscate the origin and destination of funds." **High**

        }

    ]

},

"31yytDgBEVWezWiLbwNZRgJRTP7puK34Rq": {

    "gpt-4-turbo": [

        {

            "feature": "High in_degree and out_degree of node n4",

            "reason": "The address node n4 in Layer 2 has a significantly higher in_degree and out_degree (2983) compared to other nodes. This suggests that n4 is a central hub in the transaction network, indicating a potential point of major activity or flow of transactions, which is crucial for analyzing transaction patterns or identifying key actors in financial networks." **High**

        },

        {

            "feature": "Significant in_value and out_value difference of node n4",

            "reason": "Node n4 has a large amount of in_value (210.66248163000046) and out_value (194.95980116000027), but there is a noticeable difference between these values. This discrepancy might indicate fees taken or value being siphoned off to other nodes, which could be important for financial auditing or tracking the flow of value within the network." **High**

        }

    ],

    "gpt-4o": [

        {

            "feature": "High in-degree and out-degree of address node n4",

            "reason": "The address node n4 has an unusually high in-degree and out-degree of 2983. This is a significant characteristic as it indicates that n4 is highly connected within the graph, similar to some key nodes in reference graphs such as those in graph 679 and graph 783. High connectivity of a single node is often seen in centralized operations like pools or exchanges." **High**

        },

```
            {

                "feature": "Layer 3 transactions with n4 as a recurrent node",

                "reason": "The transactions in Layer 3 repeatedly involve node n4 as both an input and
output. This pattern is indicative of transaction 'mixing' or 'tumbling', where funds are circulated
multiple times to obscure their origin, which is a common trait in tumbler or money laundering
operations. Similar behavior is observed in reference graphs like graph 303 and graph 304." High

            }

        ]

    },

    "18hu1pdhrjHvcf7f7irBcu3y3m6tUz4xyy": {

        "gpt-4-turbo": [

            {

                "feature": "High in-degrees and out-degrees in the address nodes",

                "reason": "The address nodes in Layer 2 and Layer 3 have significantly high in-degrees and
out-degrees, suggesting a high level of activity associated with these addresses. This pattern
indicates that these nodes are central to the transaction network, serving as hubs for the flow of
values. Such features are important for understanding the structure of the network and identifying
key players or bottlenecks within the transaction graph." Average(inaccurate)

            },

            {

                "feature": "Large transaction values",

                "reason": "The transaction nodes, particularly in Layer 1, show very large in_values close to
the total out_values, which suggests that the transactions are moving significant amounts of value.
This is crucial for analyzing the financial impact and importance of these transactions within the
network. The close match between in_values and out_values in major transactions also indicates
that there is little value loss or accumulation happening within these transactions, reflecting a
possibly efficient transfer system." High

            }

        ],

        "gpt-4o": [

            {

                "feature": "High Number of Transactions with Large In-Degree",

                "reason": "The transactions n1, n5, and many others have an exceptionally high in-degree
of 240, which is significantly larger than typical in-degrees observed in reference graphs like graph
304 and graph 679. This indicates a potential pooling behavior where multiple inputs are combined
into a single transaction, a characteristic commonly associated with mixing services or tumblers."
High
```

```
        },

        {

            "feature": "Large Value Transfers",

            "reason": "Transactions such as n1 and n5 involve very large value transfers (e.g.,
97.15247333 and 87.42903037 respectively). These large values are consistent with activities
observed in reference graphs like graph 303 and graph 304, where substantial value transfers are
typical of high-volume services like exchanges or mixing services. The presence of such large value
transactions suggests the graph is involved in significant financial operations, potentially indicating
an exchange or a mixing service." High

        }

    ]

},

    "bc1qkqfp85z4yfc0pejwrp87vjc9nuj9achtr3d8j5": {

        "gpt-4-turbo": [

        {

            "feature": "High number of transaction nodes",

            "reason": "The presence of a large number of transaction nodes (n1, n2, n13, n14, n15) in
the graph indicates a complex pattern of transactions. This complexity can be important for
characterizing the nature of the network, potentially indicating a system with frequent or
complicated transactions, such as a financial network or a blockchain system." Average(inaccurate)

        },

        {

            "feature": "High in_value and out_value in n24",

            "reason": "The address node n24 has significantly high in_value and out_value, suggesting
that it is a central node in terms of transaction volume. This could indicate that n24 is a hub or a key
player within the network, handling a large amount of transfers, which can be crucial for
understanding the flow of values within the network and identifying key stakeholders or
bottlenecks." High

        }

    ],

    "gpt-4o": [

        {

            "feature": "n24's high in-degree and out-degree",

            "reason": "The address node n24 has an exceptionally high in-degree and out-degree
compared to the other nodes, with both values being 2866. This indicates that n24 is a highly active
node, possibly acting as a central hub for transactions. This structure is significant as it suggests a
```

centralized point of activity that is uncommon in typical transaction networks, which can be indicative of specific behaviors such as pooling or mixing services often seen in tumblers or exchanges." **High**

```
    },

    {

        "feature": "Large number of transactions involving n24",
```

"reason": "The graph contains a large number of transactions (2903) involving n24, with many transactions having high in-degree values (e.g., n121 and n125 with in-degree of 3001 and 3000, respectively). This pattern is unusual and is indicative of automated or bulk transactions commonly seen in exchanges, tumblers, or other high-volume services. The high volume of transactions involving a single node highlights n24's importance and its role in the network¡¯s transaction flow." **Average(inaccurate)**

```
    }

  ]

},

"34m2sgkxLhNZoHr7rzmyvAFYThnnmMUwEh": {

  "gpt-4-turbo": [

    {

        "feature": "High in-degree on transaction node",
```

"reason": "Transaction node n1 has a very high in-degree (795), which suggests it is a central node receiving inputs from many different addresses. This pattern might indicate a collection or aggregation point in financial transactions, which is crucial for analyzing flow patterns or detecting potential aggregation behavior for further inspection." **High**

```
    },

    {

        "feature": "Significant out_value reduction in transaction node",
```

"reason": "The transaction node n1 shows a notable reduction from in_value of 20.06349319 to out_value of 20.00023524. This discrepancy suggests transaction fees or redistribution in smaller amounts, which are essential for understanding transaction costs or potential redistribution strategies within the network." **Average(invalid)**

```
    }

  ],

  "gpt-4o": [

    {

        "feature": "High In-degree Transaction Nodes",
```

```
            "reason": "The transaction node n1 has an exceptionally high in-degree of 795, which is
significantly larger compared to the typical in-degree values in the reference graphs. This suggests
that a large number of inputs are being consolidated into a single transaction, which is often
indicative of mixing or tumbling services." High

        },

        {

            "feature": "High Out-degree Address Node",

            "reason": "The address node n3 has an extremely high out-degree of 2321, implying that a
single address is dispersing funds to a vast number of other addresses. This type of structure is
commonly associated with money laundering activities or other illicit operations where the goal is to
obscure the origin of funds by distributing them widely." High

        }

    ]

},

    "18HuTugJTJ3cyty96SLXvTRyGQcsyscnWG": {

        "gpt-4-turbo": [

        {

            "feature": "High in_degree in transaction nodes",

            "reason": "The graph has transaction nodes with significantly high in_degree values, such as
n1 in Layer 1 with an in_degree of 240. This indicates that these nodes are major aggregation points
for transactions, reflecting a central role in the graph's financial flow which might suggest a pooling
or collection activity before redistribution." High

        },

        {

            "feature": "Large out_degree in transaction nodes",

            "reason": "Transaction nodes like n4 in Layer 1 with an out_degree of 464 also indicate a
significant distribution role. Such nodes disperse values to a large number of addresses, suggesting
their function in mass payouts or widespread transaction dissemination, which is critical for
understanding the flow of funds within the network." High

        }

    ],

    "gpt-4o": [

        {

            "feature": "High In-Degree and Out-Degree Transactions",

            "reason": "The graph contains transactions with extremely high in-degrees and out-degrees,
such as n1 with an in-degree of 240 and n4 with an out-degree of 464. This is indicative of a tumbling
```

or mixing service, where a large number of inputs and outputs are used to obfuscate the origin of funds. This structure is similar to reference graphs known for mixing services." **High**

```
    },
    {
        "feature": "Large Value Transfers",
```

"reason": "The graph shows significant value transfers, such as the transaction n4 with in_value and out_value around 6970. This is typical of mixing services, where large sums are moved to mix and hide the trail. The comparison with reference graphs like 304 and 2318, which also show large value transfers, supports this observation." **High**

```
    }
    ]
},
"1LgEYFaMP7ss1gAFMeXUYqeXG9Lnhz5yxo": {
    "gpt-4-turbo": [
    {
        "feature": "Transaction volume disparity between layers",
```

"reason": "The graph shows significant disparities in transaction volumes as you move from Layer 0, which has very small in and out values, to Layer 1 where transaction volumes increase significantly. This might indicate different roles or functions of these layers within the network, suggesting a structured flow of transactions possibly characteristic of organized financial activities or specific operational roles within the network." **High**

```
    },
    {
        "feature": "Complex connectivity in Layer 1",
```

"reason": "Layer 1 shows a complex pattern of connectivity, with transactions having multiple input and output nodes. This complexity can be pivotal in understanding the graph's function as it suggests a hub-like structure in Layer 1, potentially acting as a distribution or collection point within the network. Such features are crucial in networks where transactions are consolidated or dispersed systematically, which could be characteristic of financial operations such as pooling funds or distributing payouts." **Average(inaccurate)**

```
    }
    ],
    "gpt-4o": [
    {
        "feature": "High transaction values in Layer 1",
```

"reason": "The graph features several high-value transactions, particularly n13 (63.46903961) and n149 (185.48900004). These high-value transactions are characteristic of certain types of illicit activities such as money laundering or dark market activities. Comparing to the reference graphs, such high-value transactions are prevalent in graphs related to money laundering and exchange activities." **Average(inaccurate)**

        },

        {

            "feature": "Highly connected address nodes in Layer 2",

            "reason": "Nodes such as n34 (in_degree: 74, out_degree: 64) and n28 (in_degree: 8, out_degree: 6) show high connectivity with large in and out degrees. Such patterns are often seen in tumbler or mixing services where the aim is to obscure the source of funds by breaking the connection between incoming and outgoing transactions. This structural characteristic aligns with reference graphs of tumbler activities." **High**

        }

    ]

},

"124jDQ95xEvjjbXBwepWqp9hriWQLZeNhR": {

    "gpt-4-turbo": [

        {

            "feature": "High number of transaction inputs",

            "reason": "The transaction node n1 has 300 inputs, which is unusually high compared to a typical transaction. This indicates a gathering of funds from multiple sources, which could be a characteristic of a mixing service or aggregation activity in financial operations, commonly seen in pools or exchanges." **High**

        },

        {

            "feature": "Large in_value to out_value ratio in transactions",

            "reason": "The transaction nodes such as n1 show a significant amount of value being transacted, with slight changes between the input value (in_value) and output value (out_value). This small difference often covers transaction fees but maintaining high value in both inputs and outputs may suggest high-volume transactions typical of exchanges or large payment processors." **Average(invalid)**

        }

    ],

    "gpt-4o": [

        {

```
        "feature": "High in-degree transaction nodes",

        "reason": "The graph has transaction nodes with very high in-degrees (e.g., n1 with 300 in-
degree connections). This suggests that the address nodes are aggregating funds from multiple
sources, which is a significant characteristic observed in money laundering schemes and mixers
(tumblers). Such structures are often used to obfuscate the origin of funds." High

      },

      {

        "feature": "High out-degree transaction nodes",

        "reason": "The graph also has transaction nodes with high out-degrees (e.g., n2 with 10 out-
degree connections). This indicates that the address nodes are dispersing funds to multiple
addresses, which is another typical trait of a tumbling or mixing service. These services are designed
to break the link between the source and destination of funds, thereby enhancing anonymity." High

      }

    ]

  },

  "1JLRXD8rjRgQtTS9MvfQALfHgGWau9L9ky": {

    "gpt-4-turbo": [

      {

        "feature": "High number of outgoing transactions from a single transaction node",

        "reason": "The transaction node n1 has a significantly high out_degree of 778, which
indicates it is dispersing funds to a large number of addresses. This pattern is generally seen in
distribution centers or services managing payments or donations to multiple recipients. It's
important as it signifies the node's central role in fund allocation within the network." High

      },

      {

        "feature": "Small in_value compared to the number of out_nodes",

        "reason": "The transaction node n1 has an in_value of only 0.10476312 but manages to
output to 778 different nodes. This could suggest a form of aggregation or gathering of small inputs
to disperse slightly larger but still small amounts, typical of microtransaction platforms or services
that consolidate numerous tiny inputs for operational expenses or payouts." High

      }

    ],

    "gpt-4o": [

      {

        "feature": "High Out-Degree Transactions",
```

"reason": "The graph contains multiple transaction nodes with an exceptionally high out-degree, such as node n1 with an out-degree of 778, node n2 with an out-degree of 1702, and node n3 with an out-degree of 2647. This structure is characteristic of a 'tumbler' graph where funds are dispersed to a large number of addresses to obscure the original source." **High**

          },

          {

               "feature": "Low Transaction Values",

               "reason": "The in_value and out_value of transactions in this graph are relatively low, for example, n1's in_value is 0.10476312 and out_value is 0.10410503, while n2's in_value is 0.22297432 and out_value is 0.22153842. This is consistent with behavior observed in 'tumbler' operations, where small amounts of funds are mixed to increase anonymity." **High**

          }

     ]

},

"31vYGFwXiMCySVdB4ZHRUqvjkw4GCeitsd": {

     "gpt-4-turbo": [

          {

               "feature": "High in_degree and out_degree of address node n4",

               "reason": "The address node n4 has exceptionally high in_degree and out_degree (2960 each), which significantly stands out compared to other nodes in the graph. This indicates that n4 is a central hub in the transaction network, likely processing a substantial volume of transactions, which suggests its critical role in the flow of value through the network." **High**

          },

          {

               "feature": "Large value transaction flow through n4",

               "reason": "Address node n4 not only has high connectivity but also handles a large volume of transaction values (with in_value of approximately 209.99 and out_value of approximately 194.14). This substantial amount of value being transacted through n4 underscores its importance in the financial ecosystem represented by the graph, marking it as a key financial node." **High**

          }

     ],

     "gpt-4o": [

          {

               "feature": "High In-Degree and Out-Degree Address (n4)",

               "reason": "The address node n4 has exceptionally high in-degree and out-degree values, both being 2960. This indicates a very high level of transaction activity, which is a notable

characteristic when compared to other reference graphs. Such high in-degree and out-degree values are often seen in addresses associated with tumblers or mixing services, where funds are repeatedly cycled through numerous transactions to obscure their origins." **High**

        },

        {

            "feature": "Large Number of Transaction Nodes Interacting with a Single Address (n4)",

            "reason": "The reference node n4 interacts with a large number of transaction nodes (2992), each with varying in_values and out_values, but all connecting back to n4. This pattern is indicative of complex transaction chains often associated with tumblers, where multiple small transactions are used to combine and split funds to further obscure their origins. This is a significant structural feature that distinguishes this graph from simpler transaction patterns observed in other reference graphs." **Average(inaccurate)**

        }

    ]

},

"bc1qajlru0yxdeqsx7alw30et7jjrrfccnwuqefzgr": {

    "gpt-4-turbo": [

        {

            "feature": "High in-degree and out-degree of transaction node n1",

            "reason": "The transaction node n1 has an exceptionally high in-degree of 764 and an out-degree of 2. This indicates that it aggregates inputs from a large number of nodes, which may signify centralization of transaction inputs, making it a significant node in terms of processing or transferring a large amount of data or value." **Average(inaccurate)**

        },

        {

            "feature": "Significant difference in in_value and out_value of transaction node n1",

            "reason": "The transaction node n1 has a noticeable difference between the total input value (in_value) and the total output value (out_value), with values 1.03338828 and 1.00011845 respectively. This discrepancy suggests transaction fees or value transformations occurring within the transaction, marking it as a financially impactful node where value is potentially consolidated, redistributed, or fees are applied." **Average(inaccurate)**

        }

    ],

    "gpt-4o": [

        {

            "feature": "High In-Degree for Transaction Node",

"reason": "Transaction node n1 has an exceptionally high in-degree of 764. This is a significant deviation when compared to most reference graphs, which typically do not exhibit such high in-degrees for single transaction nodes. This indicates a high level of aggregation, which is a characteristic often associated with certain patterns in money laundering or large-scale pooling."
High

        },

        {

            "feature": "High Out-Degree for Address Node",

            "reason": "Address node n4 has an extremely high out-degree of 2345, with an out_value of 21847.207853579996. This is uncommon in the reference graphs and suggests this node is dispersing funds to a large number of recipients. Such behavior is typical in operations like tumblers or mixers, which aim to obfuscate the origin of funds by spreading out large amounts into numerous smaller transactions." **High**

        }

    ]

},

"bc1qaha42lxaedgs0vny5ety568k5fx00ql3pua23t": {

    "gpt-4-turbo": [

        {

            "feature": "High transaction value discrepancy",

            "reason": "The analysis of the graph highlights a significant discrepancy in transaction values, particularly in Layer 1 where n1 has a relatively high total input value compared to its output, indicating a potential loss or fee that could be significant in financial analysis or tracking transaction efficiency." **Low**

        },

        {

            "feature": "Complex network of address interactions",

            "reason": "The graph shows a complex layering structure where a single node in Layer 0 fans out to multiple transactions and addresses in subsequent layers. This kind of structure is critical for understanding money flow, identifying key nodes (like n1 and n3), and detecting patterns such as potential money laundering activities or key transaction points in a financial network."
Average(invalid)

        }

    ],

    "gpt-4o": [

        {

"feature": "High in-degree and out-degree of nodes",

            "reason": "The graph contains nodes with significantly high in-degree and out-degree, such as n3 with 344 in-degree and 170 out-degree, and n35 with 494 in-degree and 1387 out-degree. This suggests a high level of connectivity and complexity, which is a characteristic often seen in Ponzi and money laundering schemes, where multiple transactions are made to obscure the source of funds." **High**

        },

        {

            "feature": "Large transaction volumes",

            "reason": "The graph exhibits nodes involved in transactions with large volumes, as seen with transactions like n309 where the in_value is 173.27359382 and out_value is 173.26980182, and n723 with an in_value of 380.35740277 and out_value of 380.35345105. These large transaction volumes could be indicative of pooling or tumbling activities, where multiple smaller transactions are aggregated into larger amounts to facilitate money laundering." **High**

        }

    ]

},

"32C4jQy9TYheWcEDMHiWGYvR8wWwm4ciCT": {

    "gpt-4-turbo": [

        {

            "feature": "High in_degree and out_degree",

            "reason": "The address node n4 in Layer 2 has an extremely high number of in_degree and out_degree, both at 2888, which is significantly higher than any other node in the graph. This suggests that n4 is a central hub in the transaction network, indicating a high level of activity and possibly a key player in the flow of transactions within this network." **High**

        },

        {

            "feature": "Significant amount of transactions",

            "reason": "Layer 3 contains a very high number of transactions (2993 transactions), with many linked to node n4. This indicates that not only is there a central node with high connectivity, but there is also substantial transactional volume being processed through this node, further emphasizing its importance in the graph's structure and dynamics." **High**

        }

    ],

    "gpt-4o": [

        {

"feature": "High In-Degree and Out-Degree Addresses",

"reason": "The address node n4 in Layer 2 has an exceptionally high in-degree and out-degree of 2888. This feature is indicative of a highly active node possibly involved in numerous transactions, which is a characteristic observed in reference graphs associated with activities like pools and exchanges. Such nodes often act as intermediaries in a large number of transactions, suggesting a central role in the flow of funds." **High**

    },

    {

        "feature": "High Volume of Transactions in Layer 3",

        "reason": "Layer 3 contains a significantly high number of transactions (2993), with numerous transactions involving the address node n4. This high volume of transactions is characteristic of reference graphs related to pools and exchanges, where frequent transactions are a norm due to the nature of their operations. The large number of transactions also implies a high level of activity, which is a critical indicator when identifying the type of graph." **High**

    }

  ]

},

"116FDQkZYkMQG31mTpe9us2tpUba5fGEfs": {

  "gpt-4-turbo": [

    {

        "feature": "High in_degree in transaction nodes",

        "reason": "The node n1 in Layer 1 has a significantly high in_degree of 300, indicating a large number of inputs, which suggests it may be aggregating transactions from multiple sources, potentially indicating a mixing or pooling service." **High**

    },

    {

        "feature": "Large number of related address nodes",

        "reason": "Layer 2 contains 285 address nodes, which implies a complex network of transactions and interactions. This complexity might indicate a system designed to obfuscate or launder transactions through numerous small transactions spread across many addresses." **High**

    }

  ],

  "gpt-4o": [

    {

        "feature": "High In-degree Transactions",

    "reason": "The transactions in Layer 1, specifically node n1, have very high in-degrees (300), indicating that a large number of inputs are consolidated into a single transaction. This pattern is often observed in tumbling or mixing services, where numerous small inputs are aggregated into single transactions to obfuscate the trail." **High**

    },

    {

        "feature": "Significant Value Aggregation",

        "reason": "Node n4 in Layer 2 has an in_value and out_value of 38.20283477000001, which is significantly higher than other nodes in the graph. This indicates that this address acts as a major aggregator or distributor of funds. Such nodes are often central in money laundering or mixing operations, where large sums are moved in and out to obscure the source and destination of funds." **High**

    }

    ]

},

"113Hs6yxc3ocAYFwNN61SZYNbA3wzKdLoC": {

    "gpt-4-turbo": [

    {

        "feature": "Layer 0 structure",

        "reason": "The graph starts with a single address node in Layer 0, which is integral as the source node for all transactions in the subsequent layers. It establishes the initial state of the graph and serves as the foundation for the transaction flow, making it a crucial feature for understanding the graph's operation and its connection to the broader network." **Average(invalid)**

    },

    {

        "feature": "High in-degree in Layer 1",

        "reason": "The transaction node n1 in Layer 1 has a significantly high in-degree of 300, indicating that it aggregates inputs from a vast number of nodes, which suggests a central point of data or value consolidation. This could imply potential points of vulnerability or critical areas for transaction validation and monitoring, making it a vital feature for network analysis and security." **High**

    }

    ],

    "gpt-4o": [

    {

        "feature": "High In-Degree Transactions",

"reason": "The transactions in Layer 1, such as n1 with an in-degree of 300, indicate a high volume of inputs converging into single transactions. This is a characteristic feature of mixers or tumblers, where multiple inputs are combined to obscure the trail of funds. This pattern is consistent with behaviors observed in known mixer or tumbler reference graphs, such as graph 2660 and graph 3018." **High**

```
        },

        {

            "feature": "High Volume and Structured Outputs",
```

"reason": "Layer 3 transactions, such as n299 and n301, have a large number of outputs (e.g., 300), which are directed towards a single address (n3). This structured dispersal of funds is typical of tumblers or mixers, aiming to confuse the trail of transactions. The presence of such patterns aligns with reference graphs known for tumbling activities, like graph 304 and graph 303, which show similar structured outputs aimed at obfuscating the transaction paths." **Low**

```
        }

    ]

  },

  "32kJeUxWMsMPwwR1sYfDyPEbyqWboQJ4bP": {

    "gpt-4-turbo": [

      {

          "feature": "Highly active node n4",
```

"reason": "The address node n4 has an exceptionally high in_degree and out_degree, indicating a central role in the transactions of the graph. It is involved in 2983 transactions both as the source and destination, highlighting its importance in the network's flow of value. This is a crucial feature as it can indicate a hub in transaction activities, which is significant for understanding the graph's structure and the potential influence of this node." **High**

```
        },

        {

            "feature": "Transaction values consistency",
```

"reason": "The values of transactions involving the major node n4 are moderately high and consistent, suggesting that n4 is systematically important for maintaining the economic activity within the graph. This consistency in transaction values can be crucial for the stability of the network, implying that n4 could be a trusted or pivotal entity in this financial system." **Low**

```
        }

    ],

    "gpt-4o": [

      {
```

"feature": "High In-Degree and Out-Degree Address Node",

"reason": "The address node n4 has both a high in-degree and out-degree of 2983, indicating it is highly connected within the graph. This characteristic is significant when compared to reference graphs, such as graph 303, graph 304, graph 679, and others, where specific nodes with high connectivity often indicate the central hubs of activity. In most reference graphs, such high connectivity is often associated with behaviors like tumbling or mixing services, where a single address interacts with numerous transactions to obscure the flow of funds." **High**

},

{

"feature": "Numerous Small Transactions",

"reason": "There is a large number of transactions with relatively small values originating from or directed towards the highly connected address node n4. For instance, transactions like n78 (0.0260647), n128 (0.03949529), n145 (0.09497537), and many others with similar small values are prevalent. This pattern is commonly found in reference graphs like graph 3014 and graph 3426, which are indicative of behaviors such as money laundering, where funds are broken down into smaller amounts and mixed through numerous transactions to evade detection." **High**

}

]

},

"32C7jJX8AXWdrPayGTSTspyiRxa7t4FWYN": {

"gpt-4-turbo": [

{

"feature": "High in_degree and out_degree of address nodes",

"reason": "The address nodes n4 in Layer 2 and n3 in Layer 2 have significantly high in_degrees and out_degrees compared to other nodes. n4 has in_degree: 2741 and out_degree: 2741, and n3 has in_degree: 202 and out_degree: 47. This indicates that these addresses are central to the transactional activity in the graph, suggesting a hub-like role in the network, making them critical for the flow of value." **High**

},

{

"feature": "Value flow through transactions",

"reason": "The transactions in the graph, like n1 in Layer 1, handle significant values (in_value: 0.71285637, out_value: 0.71274999) and act as connectors between multiple address nodes. These transactions aggregate inputs from various addresses and distribute outputs to others, indicating a redistribution or mixing-like behavior which is key in understanding the graph's function in terms of transactional flow and potentially identifying patterns like mixing services or large transaction aggregators." **Average(invalid)**

}

```
    ],

    "gpt-4o": [

      {

        "feature": "High in-degree and out-degree of address n4",

        "reason": "Address n4 has an in-degree and out-degree of 2741, which is significantly higher
than most nodes in the reference graphs. This indicates that n4 is a highly connected node,
facilitating a large number of transactions. Such high connectivity is a characteristic often seen in
'exchange' or 'pool' graphs, where a central node interacts with many others." High

      },

      {

        "feature": "Large number of transaction nodes",

        "reason": "The graph contains 2988 transaction nodes in Layer 3, which is an unusually high
number compared to reference graphs. This suggests a high frequency of transactions, possibly
indicative of a 'tumbler' or 'pool' type graph, where numerous transactions are processed to obscure
the origins and destinations of funds." High

      }

    ]

  },

  "bc1qahehqcu5zhdk05h2u480ukv56q0lz9h3ymw54e": {

    "gpt-4-turbo": [

      {

        "feature": "High transaction volume",

        "reason": "The graph includes a transaction node (n1) with a high number of outputs (81
outputs), indicating a significant distribution of values to multiple addresses. This is a key feature as
it suggests either a collection point distributing to multiple parties or a form of consolidation
transaction, which is critical for understanding the flow of value across the network." High

      },

      {

        "feature": "Significant value transfer",

        "reason": "The transaction nodes (n1 and n2) handle relatively large amounts of value
compared to the input values, emphasizing the graph's role in significant value transfer within the
network. This is important as it highlights the graph's impact in terms of economic value flow, which
can be a crucial aspect in analyzing transaction patterns for applications like fraud detection or large-
scale transaction tracking." High

      }

    ],
```

```
    "gpt-4o": [

      {

        "feature": "High In-degree and Out-degree Transactions",

        "reason": "The graph contains transactions like n1 and n2, which have high in-degrees and
out-degrees. For instance, n1 has 4 in-degrees and 81 out-degrees, while n2 has 3 in-degrees and 72
out-degrees. This pattern is similar to the ponzi schemes in the reference graphs, where a single
input results in numerous outputs, indicating potential distribution of funds to multiple addresses."
```
Average(inaccurate)
```
      },

      {

        "feature": "High-value Transactions",

        "reason": "The transactions in this graph involve significant values. For example, n1 has an
in-value of 29.3031929 and n2 has an in-value of 17.57991637, both distributing large sums across
many addresses. High-value transactions are characteristic of money laundering and ponzi schemes
in the reference graphs, where large sums are moved to obscure the source."
```
High
```
      }

    ]

  },

  "11c6fLP5cyYykSYztf3hK1fkLaFW8cnJS": {

    "gpt-4-turbo": [

      {

        "feature": "High transaction volume in n11",

        "reason": "The address node n11 demonstrates significantly higher in and out transaction
volumes compared to other nodes. It handles hundreds of thousands of transactions, indicating it
might be a central hub or exchange in this network, influencing liquidity and transaction flow."
```
High
```
      },

      {

        "feature": "Disproportionate value movement",

        "reason": "Despite n11's high transaction volume, the values transacted (both in and out)
are also exceptionally high, suggesting that this node is not just a passive relay but actively manages
or exchanges large sums, possibly indicating financial importance or centrality in the network."
```
High
```
      }

    ],

    "gpt-4o": [

      {
```

        "feature": "High Transaction Inflow and Outflow from Node n11",

        "reason": "The address node n11 has extremely high in-degree and out-degree values (2914 each), as well as high in-value and out-value totals (203969.0621753901 and 204181.5973637601, respectively). This is significantly higher than typical transaction nodes in other reference graphs. This suggests that node n11 is a central hub for transactions, which is a common characteristic in money laundering and tumbling operations. Comparing to reference graphs like graph 304 or graph 783, which also exhibit high transaction volumes, n11 stands out even more." **High**

    },

    {

        "feature": "Recurrent Transactions with High Values",

        "reason": "Multiple transactions involving node n11 have very high values, such as n1008 (139.20570077), n1013 (137.40628375), and n1066 (126.62495423). These transactions have minimal outflow differences, indicating that the same amounts are being shuffled around. This is a pattern often seen in tumbling services where the same amount of money is repeatedly sent to different addresses to obscure the original source. This behavior is not as prevalent in the reference graphs where nodes typically do not engage in such high-value repetitive transactions." **High**

    }

  ]

  }

}