



Developing a Python Tool to Validate IP Addresses, Determine Class, and Calculate Subnet Ranges

COMPUTER NETWORKS(Team C11)

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1. Project Overview

Aim

To create a Python-based tool that can:

- 1 Validate IPv4 and IPv6 addresses
- 2 Identify the IP class (A-E)
- 3 Calculate subnet ranges and broadcast addresses

Motivation

Simplify manual network configuration tasks.



2. Objectives

Project Objectives

Develop an automated
IP validation tool

Understand differences
between IPv4 and IPv6

Implement subnetting
logic programmatically

Provide user-friendly CLI
or GUI output



3. Concepts Used

Core Networking & Python Concepts

1

Networking Concepts:

- IP address structure
- Subnet masks and network classes
- CIDR notation

2

Python Concepts:

- String handling and regex for validation
- `ipaddress` module (for subnet and class detection)
- Functions and exception handling

4. Understanding IP Addresses

What is an IP Address?

IPv4: 32-bit, written as 192.168.1.1

IPv6: 128-bit, written as
2001:0db8:85a3::7334

Uniquely identifies a device in a network.

Feature	IPv4	IPv6
Length	32-bit	128-bit
Format	Decimal (4 octets)	Hexadecimal (8 groups)
Example	192.168.0.1	2001:db8::1

5. IP Address Classes & Subnet Masks

IP Classes and Subnet Masks

Class	Range	Default Subnet Mask	Usage
A	1.0.0.0 – 126.255.255.255	255.0.0.0	Large networks
B	128.0.0.0 – 191.255.255.255	255.255.0.0	Medium networks
C	192.0.0.0 – 223.255.255.255	255.255.255.0	Small networks
D	224.0.0.0 – 239.255.255.255	N/A	Multicasting
E	240.0.0.0 – 255.255.255.255	N/A	Experimental

6. Python Tool Design & Workflow

Tool Design

Input: IP address
(IPv4/IPv6)

Validation: Regex
or
`ipaddress.ip_address()`

Determine Class
(if IPv4)

Calculate Subnet and
Broadcast (using `ip_network()`)

Output results



Tool Design

Sample Code Snippet:

```
import ipaddress ip = input("Enter IP: ") try:  addr =  
ipaddress.ip_address(ip)  print("Valid IP:", addr)  if addr.version == 4:  
print("Class:", "A" if addr.is_private else "Public") except ValueError:  
print("Invalid IP")
```



7.OUTPUT

IP Address (IPv4 or IPv6): 192.168.1.10

Subnet Mask / CIDR Prefix (optional): 255.255.255.0

Input looks valid 

Validate

Summary

192.168.1.10 is a private Class C IPv4 address. Subnet 192.168.1.0/24 has 254 usable hosts (from 192.168.1.1 to 192.168.1.254).

Property	Value
Valid IP?	Yes
IP Version	IPv4
IP Address	192.168.1.10
Network Address	192.168.1.0
Prefix Length	/24
Total Addresses in Subnet	256
Private Address?	Yes
Globally Routable?	No
IP Class	Class C
Subnet Mask	255.255.255.0

IP Address (IPv4 or IPv6): 192.168.1.10

Subnet Mask / CIDR Prefix (optional): 255.255.255.0

Input looks valid 

Validate

Summary

192.168.1.10 is a private Class C IPv4 address. Subnet 192.168.1.0/24 has 254 usable hosts (from 192.168.1.1 to 192.168.1.254).

Property	Value
Prefix Length	/24
Total Addresses in Subnet	256
Private Address?	Yes
Globally Routable?	No
IP Class	Class C
Subnet Mask	255.255.255.0
Wildcard Mask	0.0.0.255
Broadcast Address	192.168.1.255
First Usable Host	192.168.1.1

8.Difference Between IPv4 and IPv6

IPV4

Address length is 32-bit

Format is Decimal

Example :192.168.1.1

Total Address is ~4.3 Billion

Type is Dotted-decimal

Security :Optimal IPSec

Broadcast is Supported

NAT Required : Yes

Auto Config :DHCP/manual

IPV6

Address length is 128-Bit

Format is Hexadecimal

Example :2001:db8:85a3:8a2e:370:73334

Total Address is ~340 Undecillion

Type is Colon-Seperated

Security : IPSec Mandatory

Broadcast is Not Supported

NAT Required : No

Auto Config : SLAAC

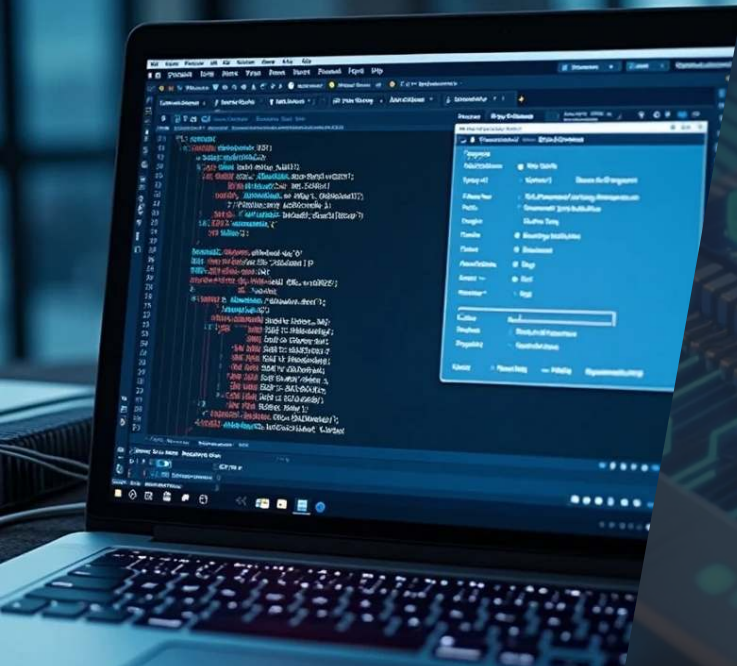
9. Conclusion & Future Scope

Conclusion

- The tool simplifies IP validation and subnetting.
- Demonstrates real-world Python networking application.

Future Enhancements

- GUI-based interface
- Integration with database or network scanning tools





THANK YOU