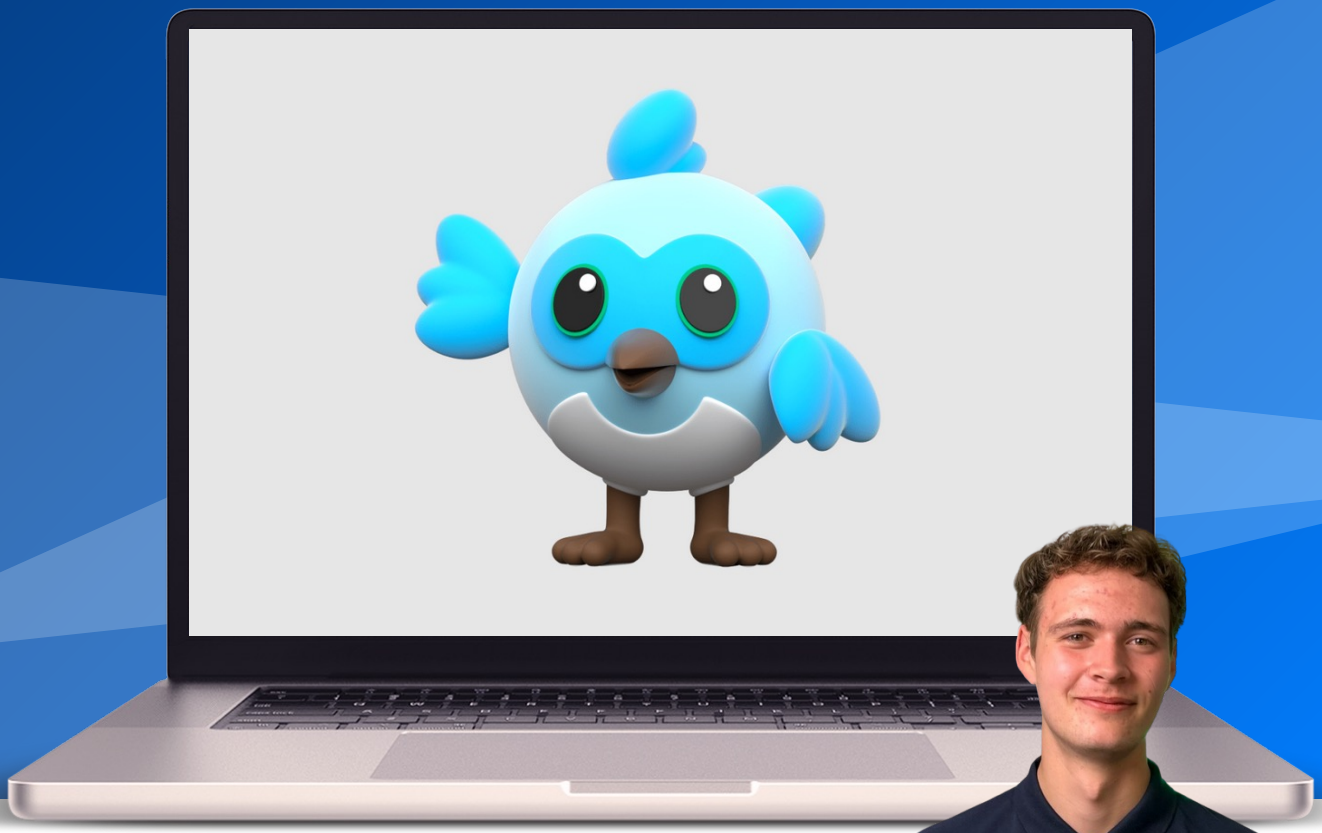


Flutter

12.01.2024

Julian Hartl

That’s me

Julian Hartl

- Computer Science student at TUM
- Software Engineer at SelectCode for ~ 2 years
- Currently: Full stack development
- Before: Mainly Flutter

We develop the future

We are an IT agency for startups and medium-sized businesses

2017	18	10+
Foundation	Team members	Projects

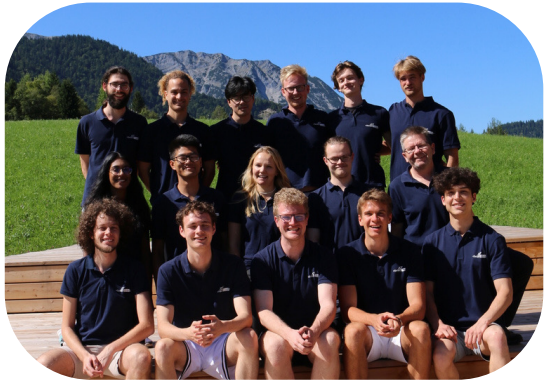
<Select Code />

We are an IT service provider to develop innovative and sustainable SaaS platforms, apps and AI-based tools to advance the technology of the future. With our development team in Munich and our strong ties to TUM, we are at the cutting edge of technology.

what we use besides Flutter:

Our Top 3 why...

...you should join the SelectCode



Working student team

currently 16 working students

Events & Workshops

eg. SelectCode Weekend

Good salary

18 - 27 €

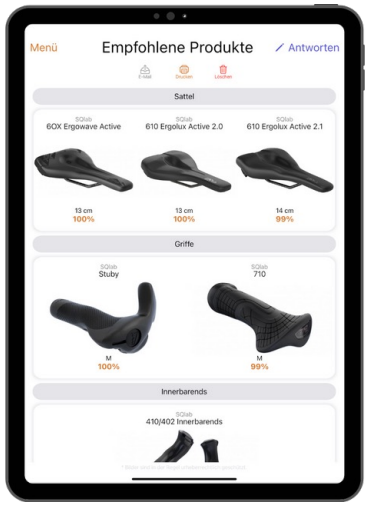
Still free on 19.01.?

Then take part in our Coding Escape Room competition!

SQlab Profiler

Case Study

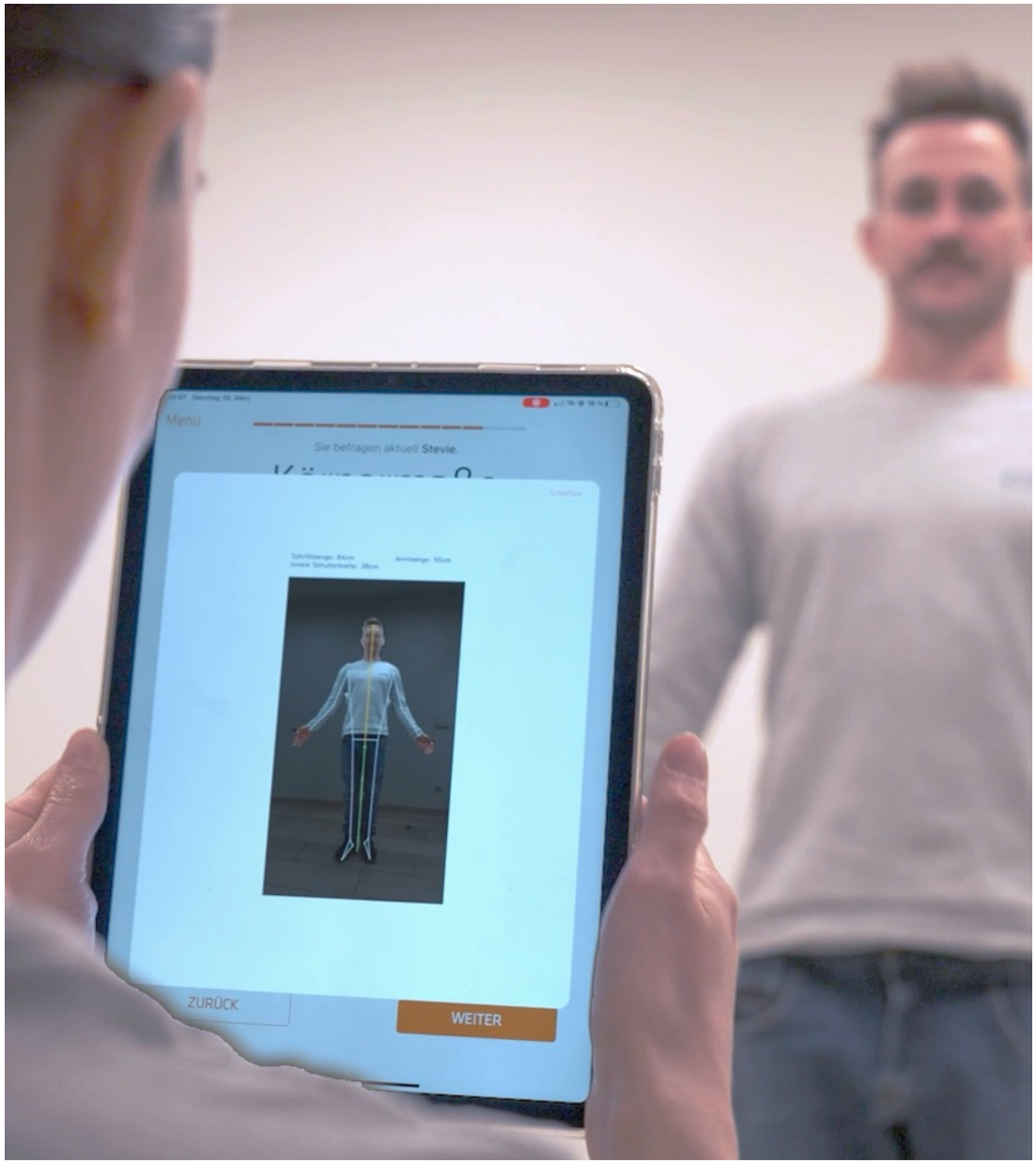
iPad app for 3D measurement and determination of suitable saddle, grip, etc.



→ Over 20.000 measurements worldwide

→ MVP after 2 months

A product for SQlab SPORTS ERGONOMICS



Introduction to Flutter

Julian Hartl

Overview

Why Flutter?

Flutter Basics

Building a Chat-GPT Clone

Why Flutter?

What even is Flutter?

What even is Flutter?

"Flutter is an open source framework by Google for building beautiful, natively compiled, multi-platform applications from a single codebase."

- Open source UI software development toolkit
- Supports many platforms
- Single codebase

Your experience with mobile development

Did you enjoy it? Why/Why not?

What does Flutter offer?

What does Flutter offer?

- Cross-Platform development (Android, iOS, Web, Windows, macOS, Linux, Fuchsia)
- Performant due to Ahead-of-Time (AOT) Compilation of Dart
- Expressive and flexible UI (large set of prebuilt components)
- Hot reload (instant UI updates)
- Consistent behavior across all platforms
- Strong community and ecosystem (wide adoption in the industry)

Applications in the wild

“Saved about 60-70% of their engineer’s time”

“Time saving & code-sharing”

“No more troubleshooting cross-platform functionality”

”Build & design once”

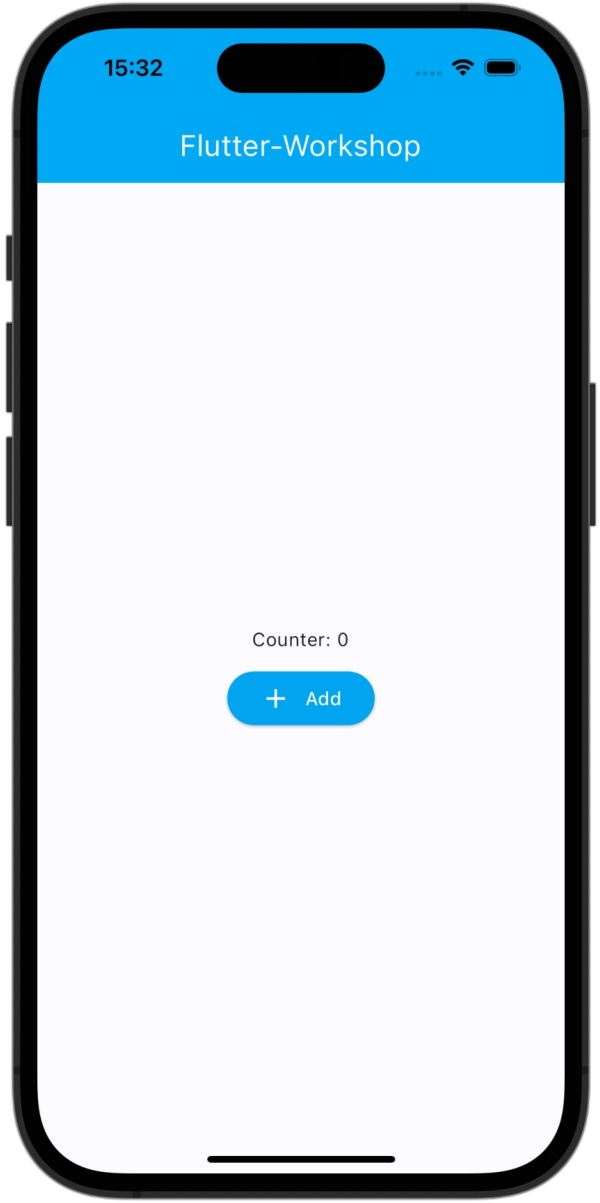
Summary

- Build once for all platforms
- Native performance
- Rich ecosystem & wide adoption

Flutter Basics

Widgets


Every-
thing
is a
Widget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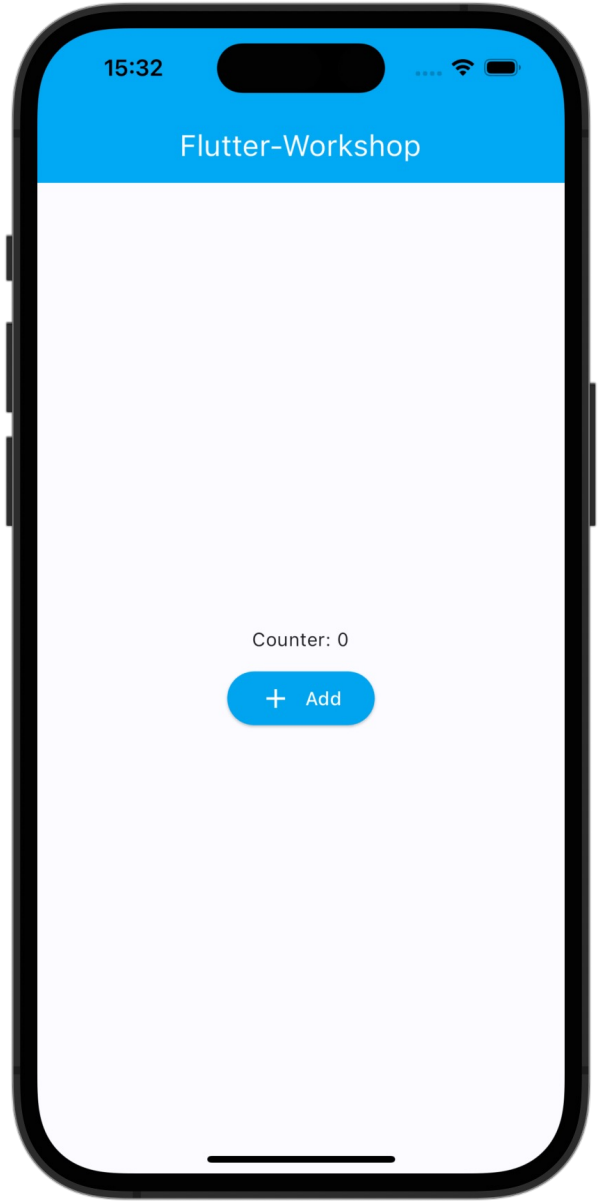
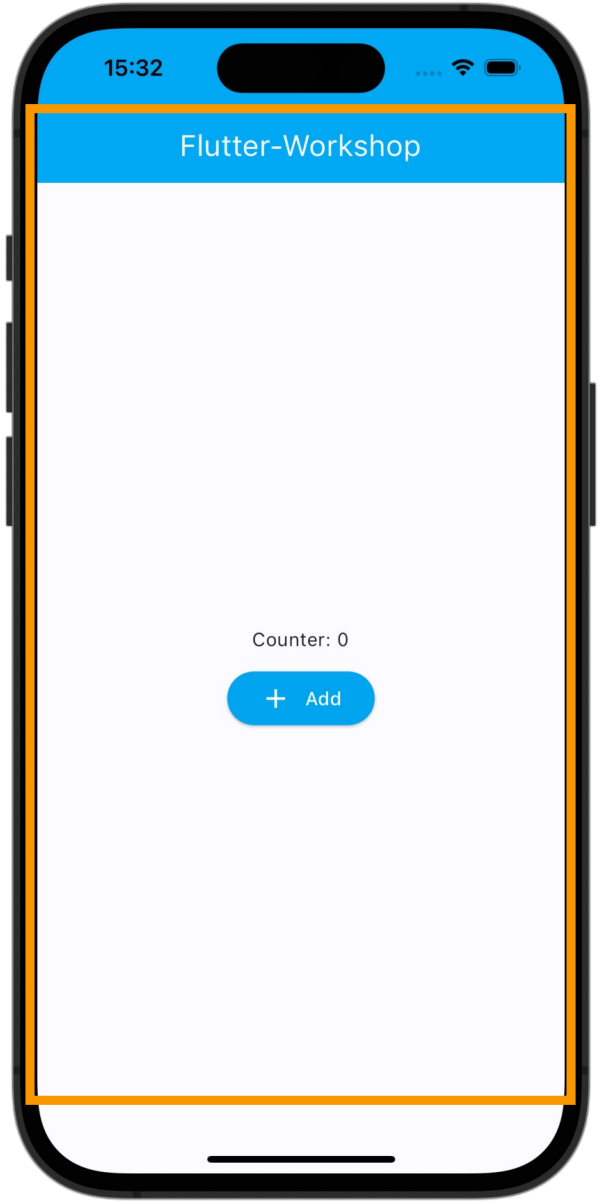
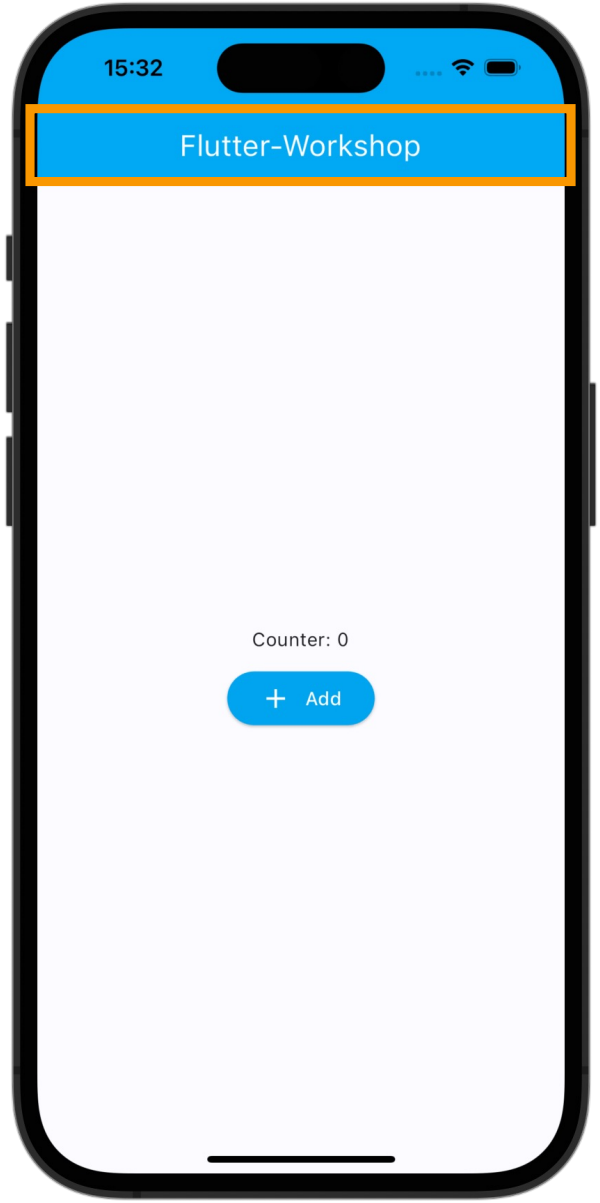


Root Widget



Root Widget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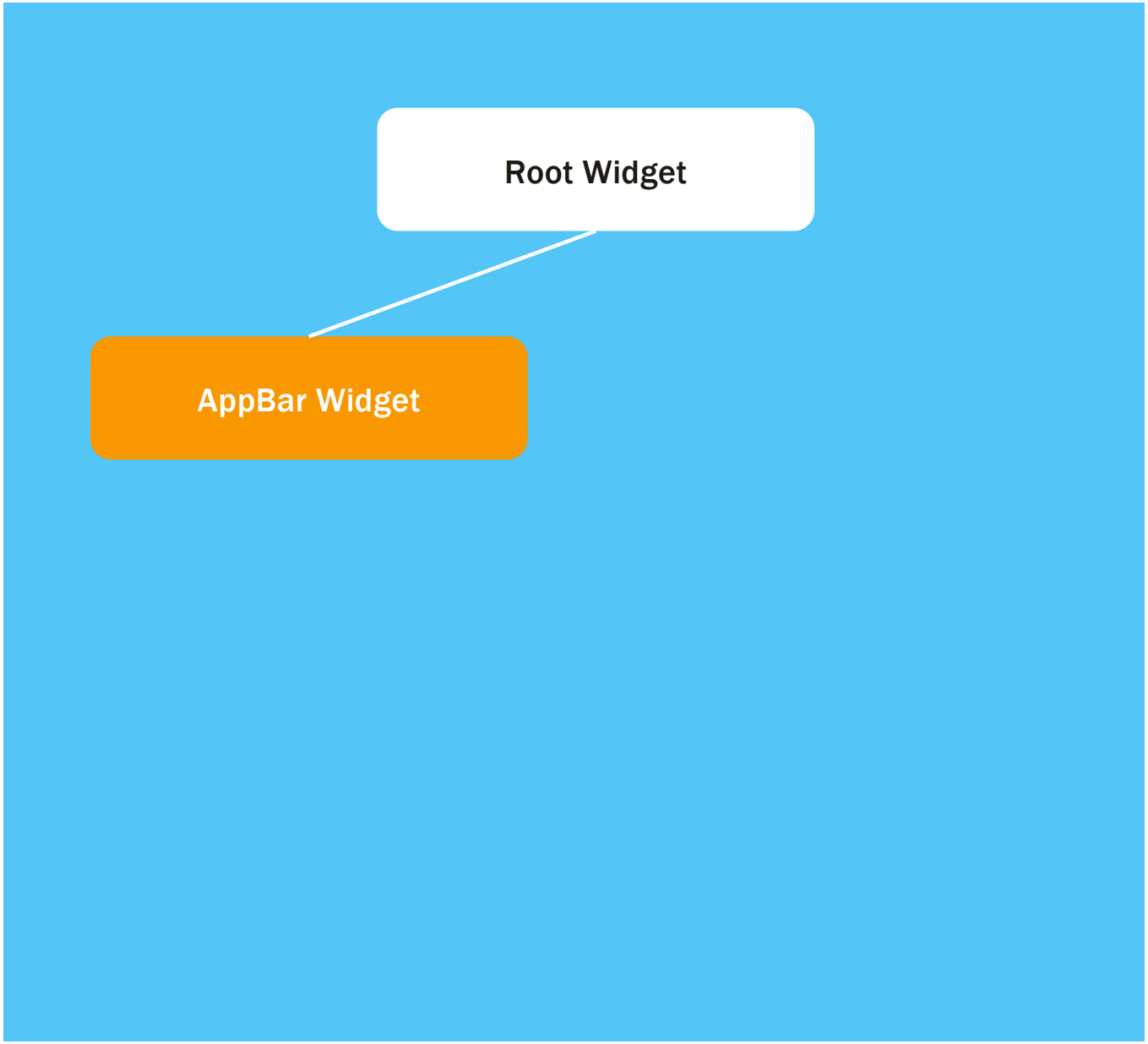
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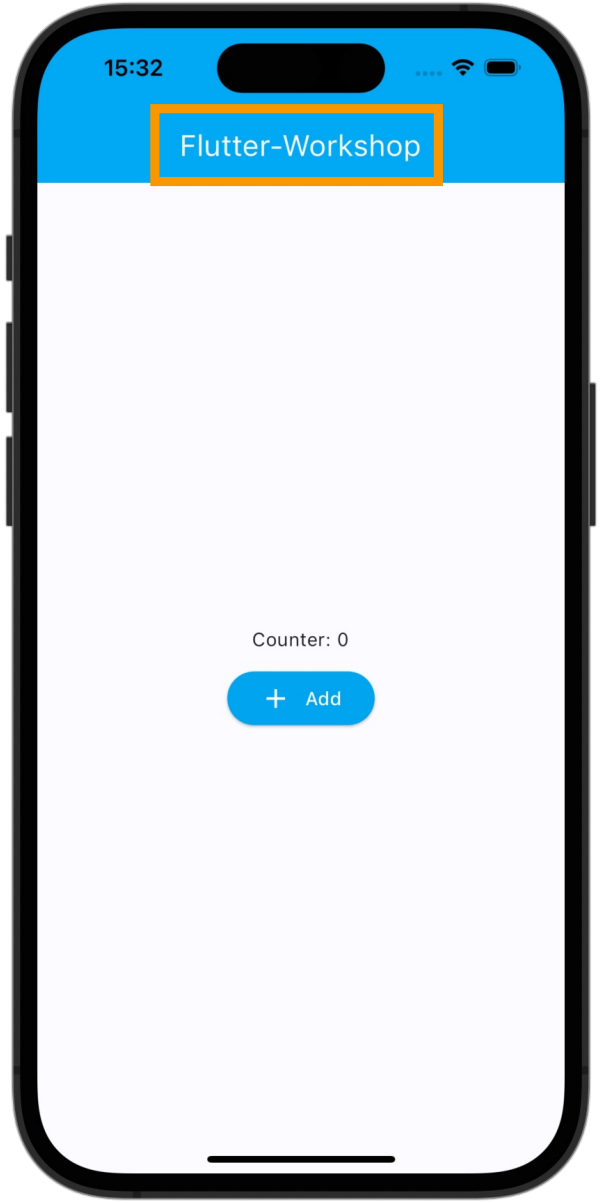
AppBar Widget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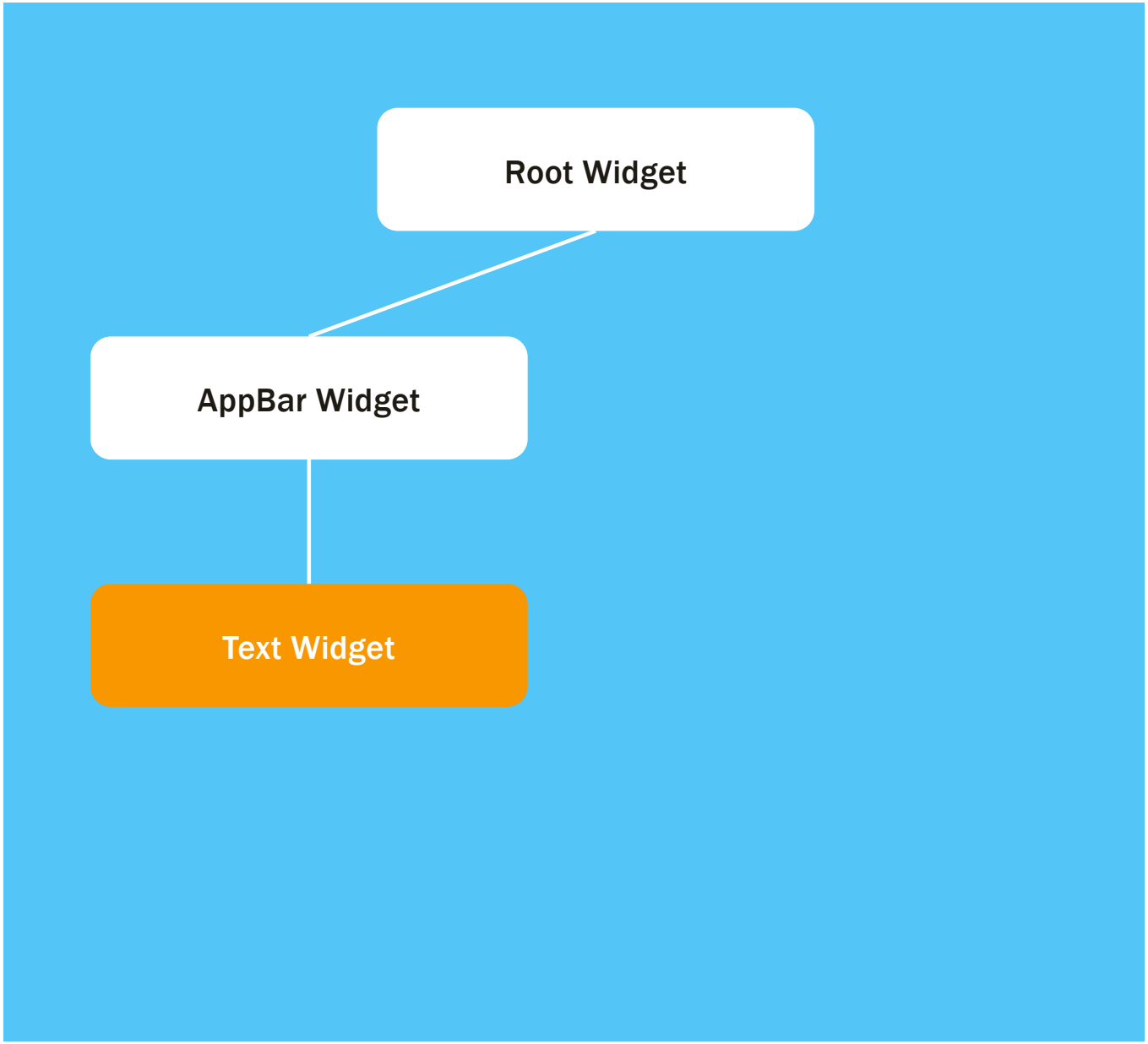
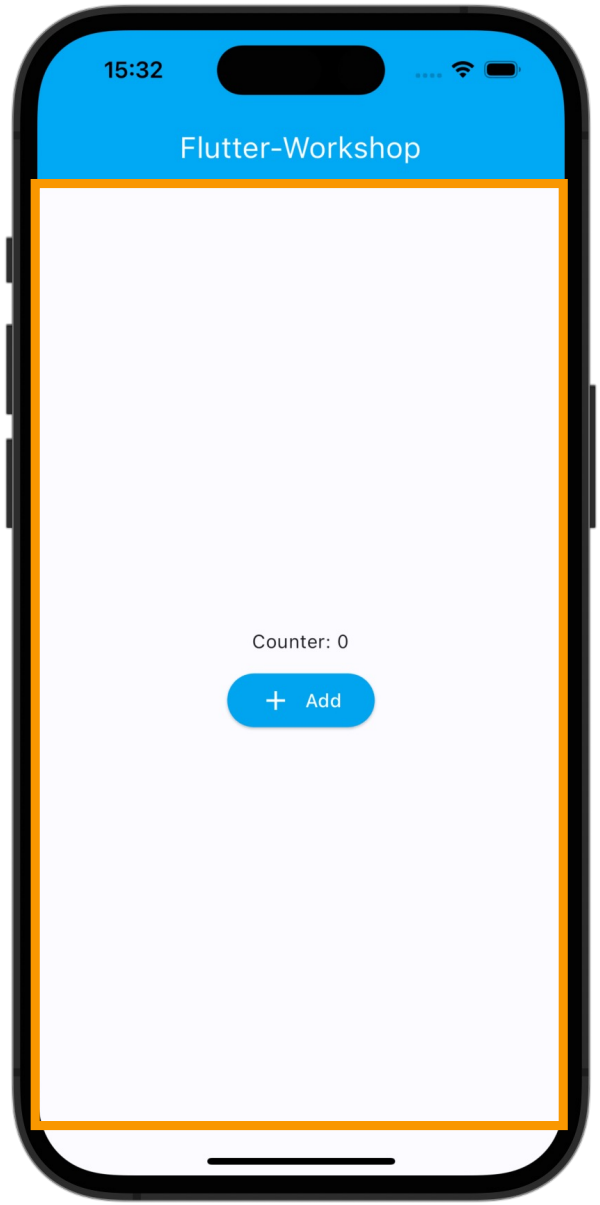

Root Widget
AppBar Widget
Text Widget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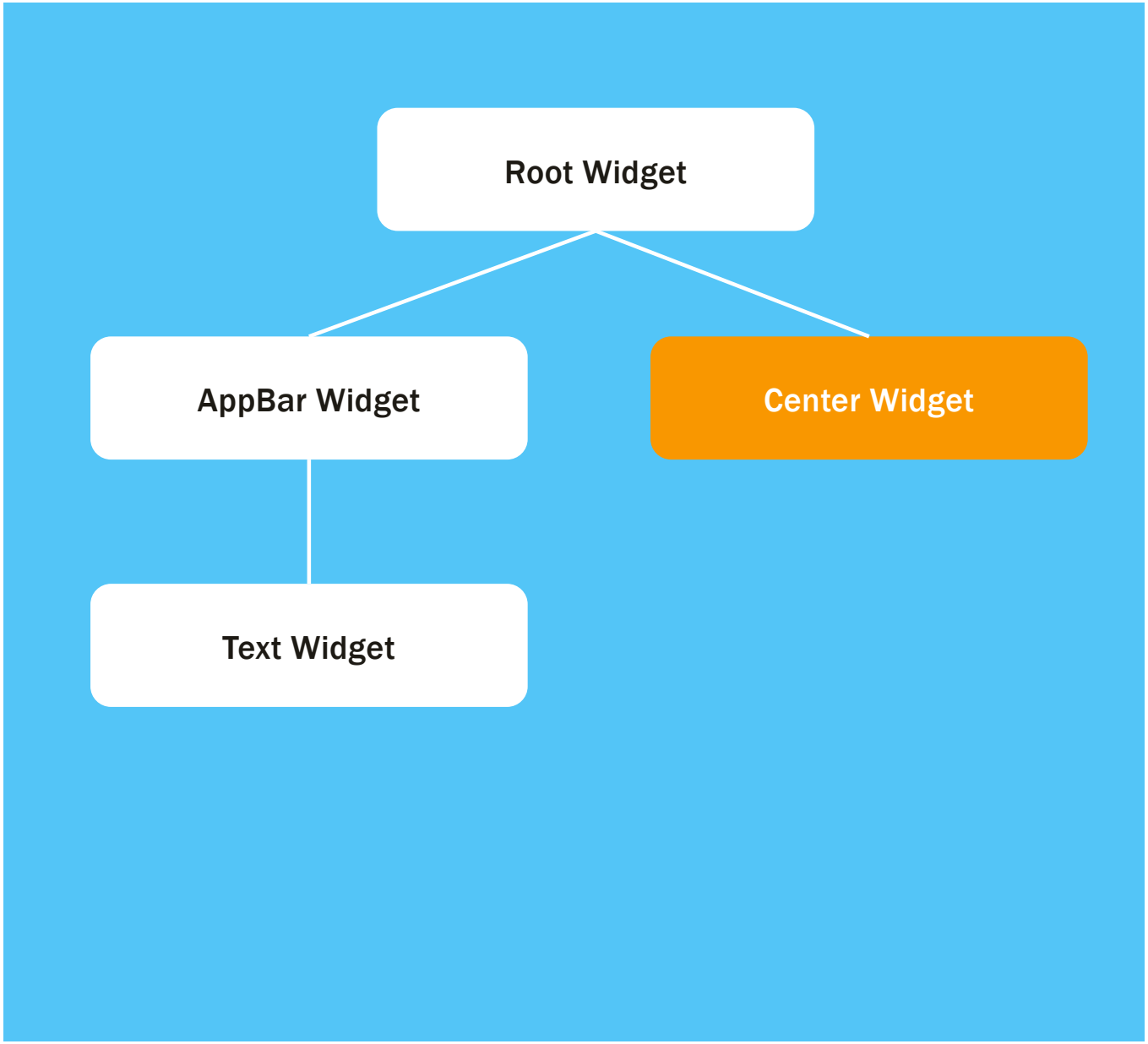
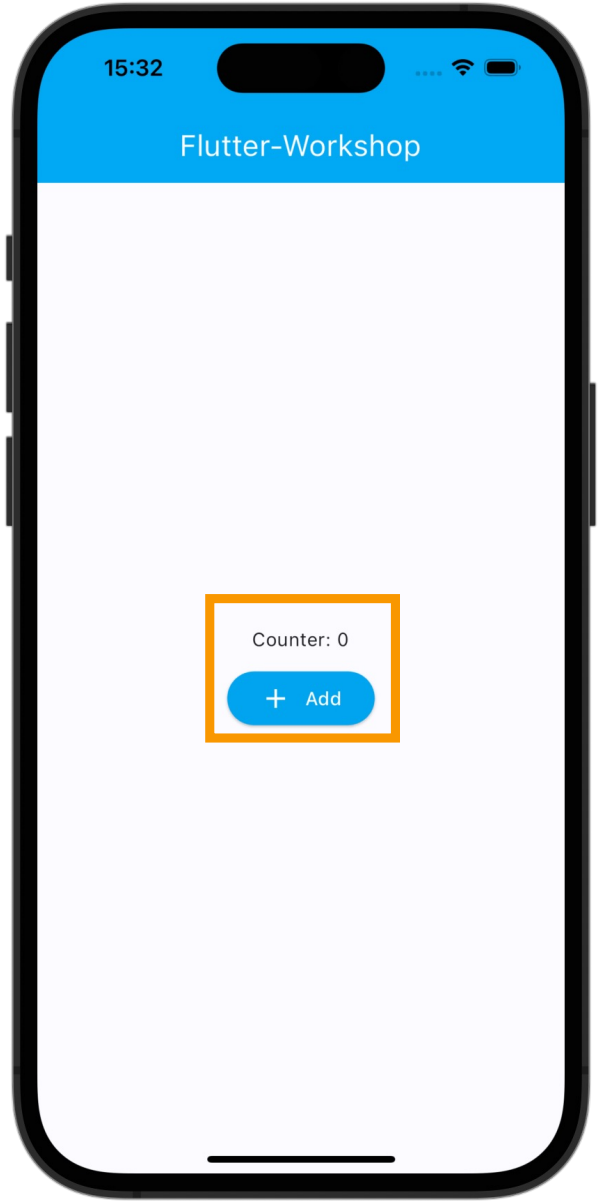

Root Widget
AppBar Widget
Center Widget
Text Widget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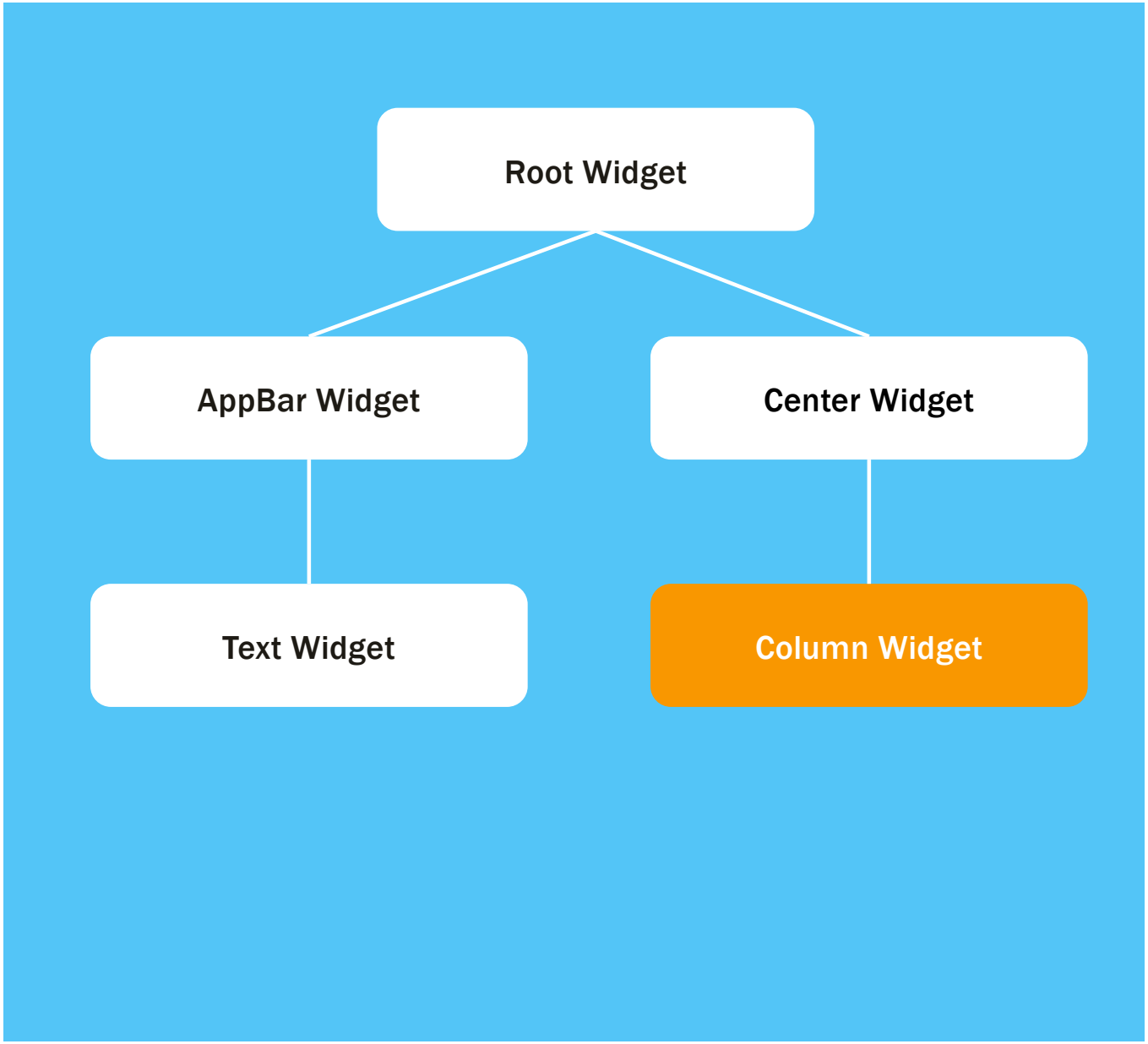
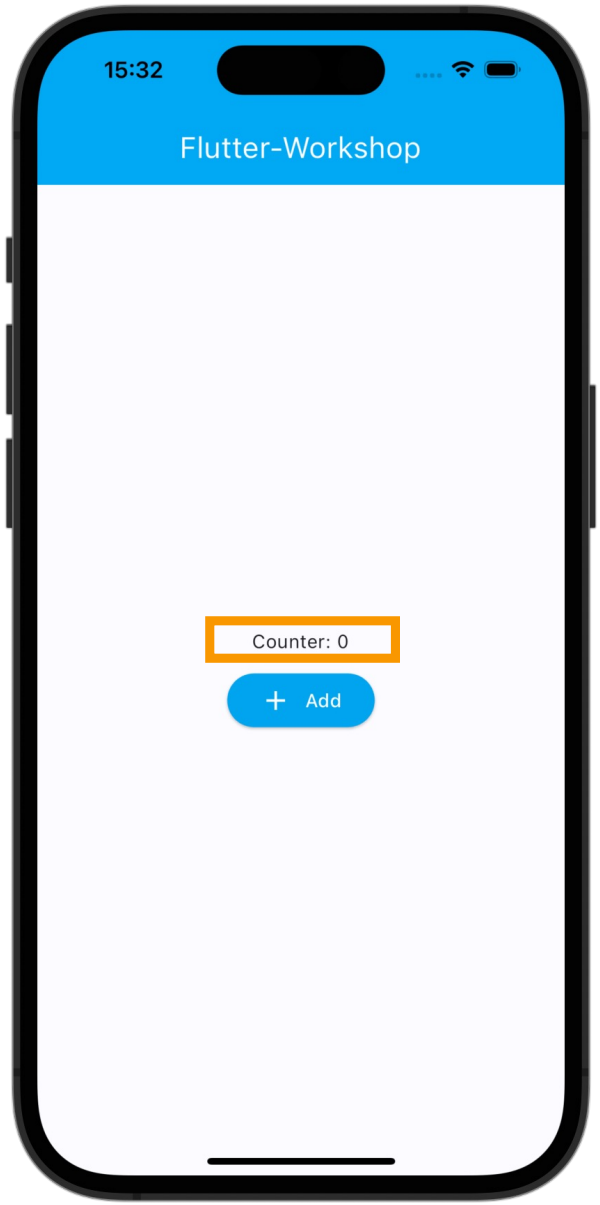

Root Widget
AppBar Widget
Center Widget
Text Widget
Column Widget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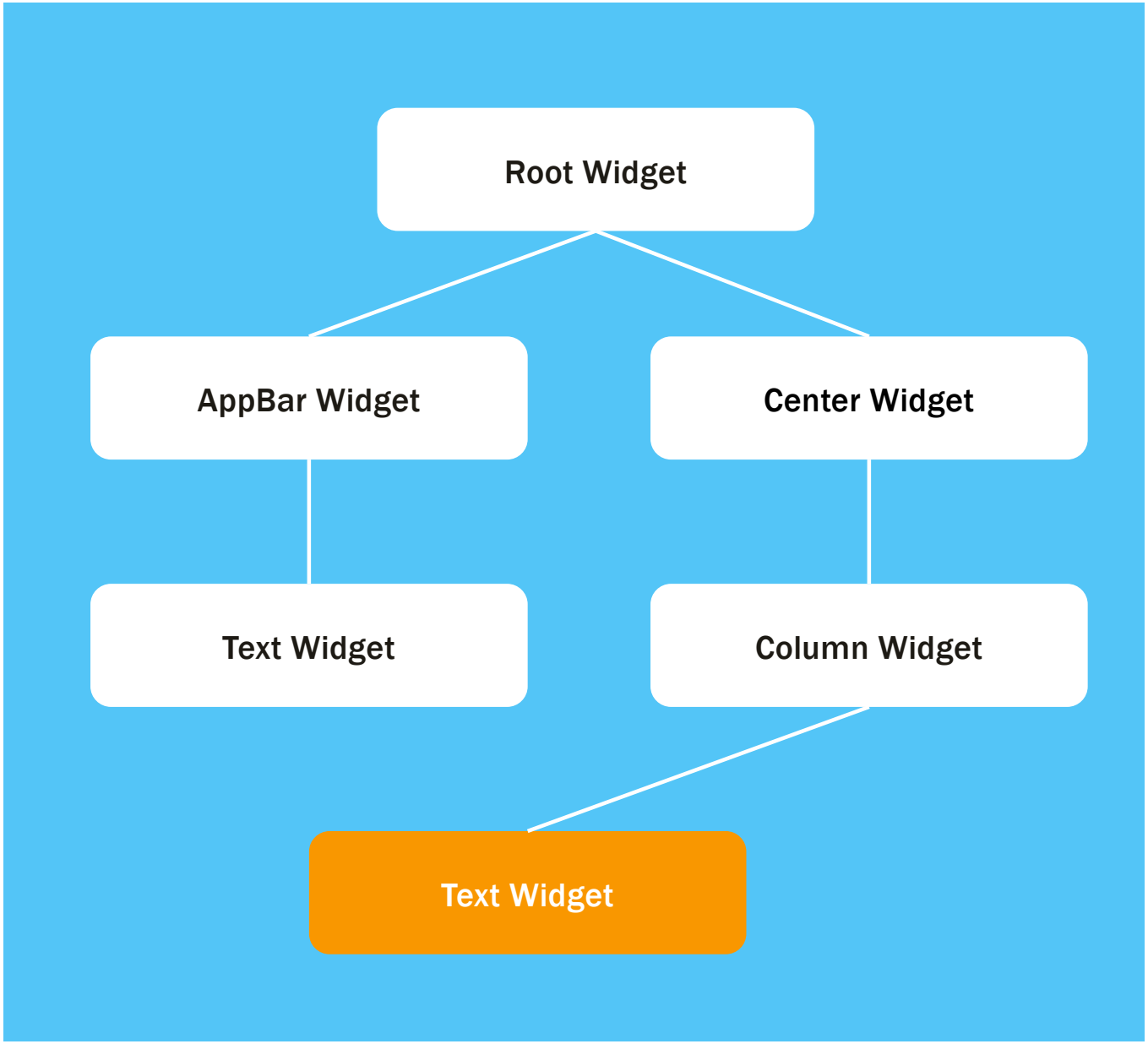
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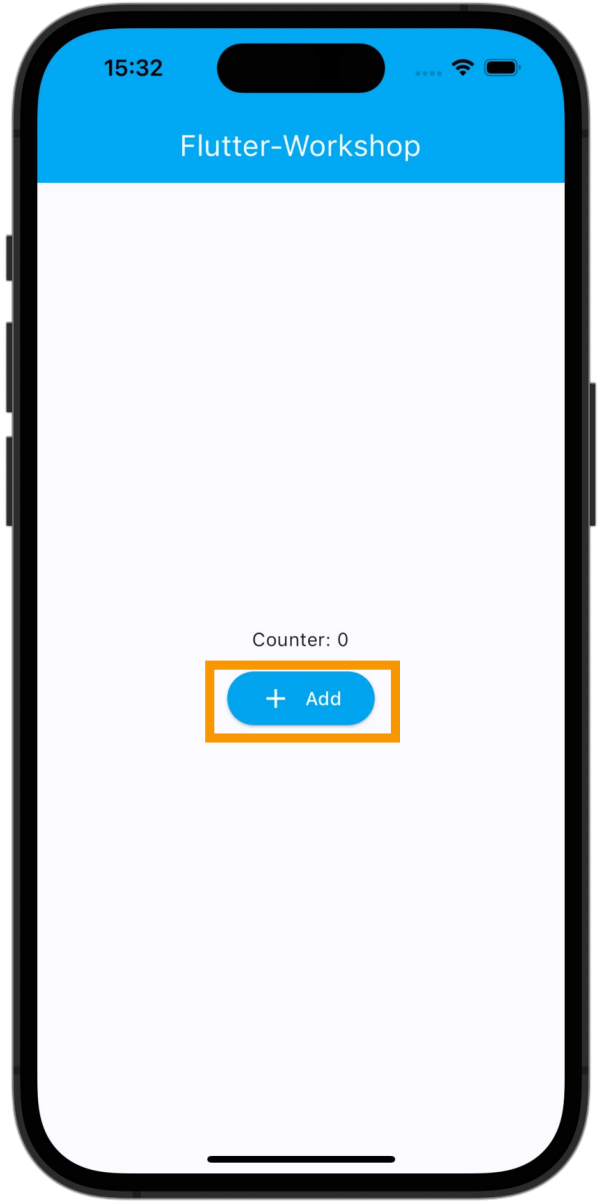
AppBar Widget
Center Widget
Text Widget
Column Widget
Text Widget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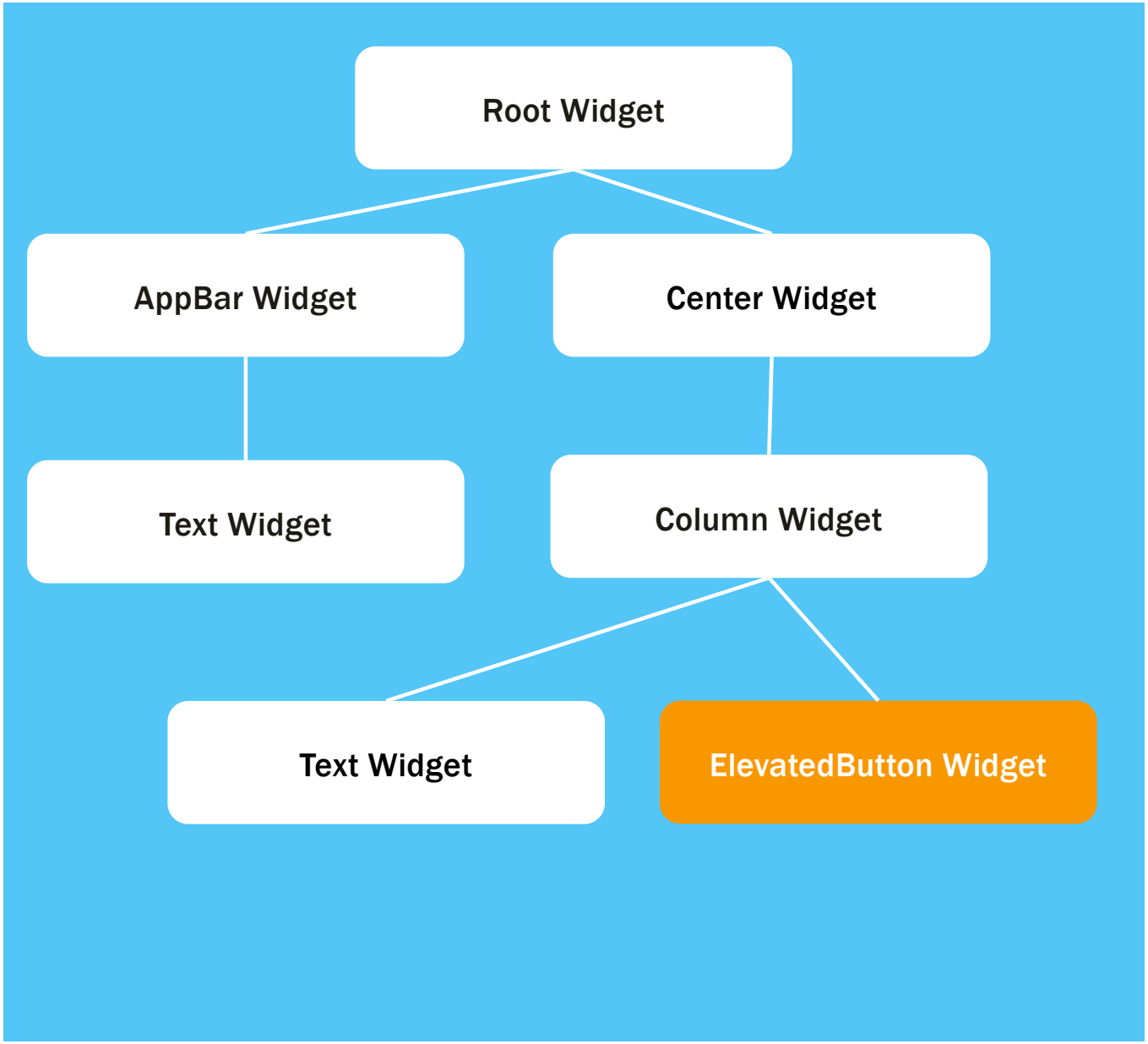
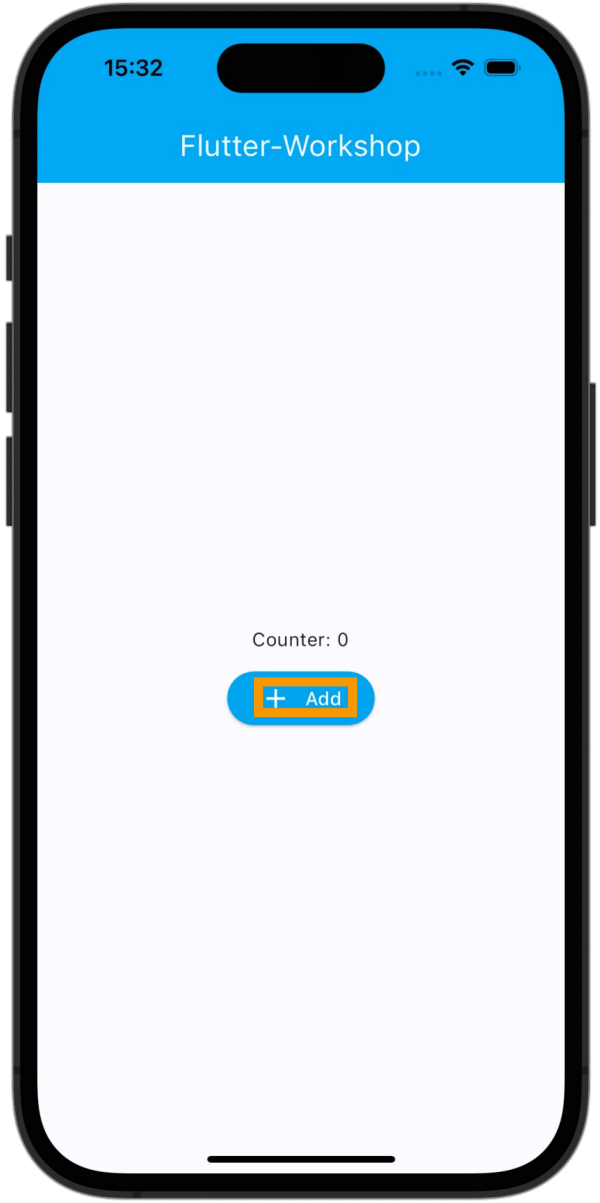

Root Widget
AppBar Widget
Center Widget
Text Widget
Column Widget
Text Widget
ElevatedButton Widget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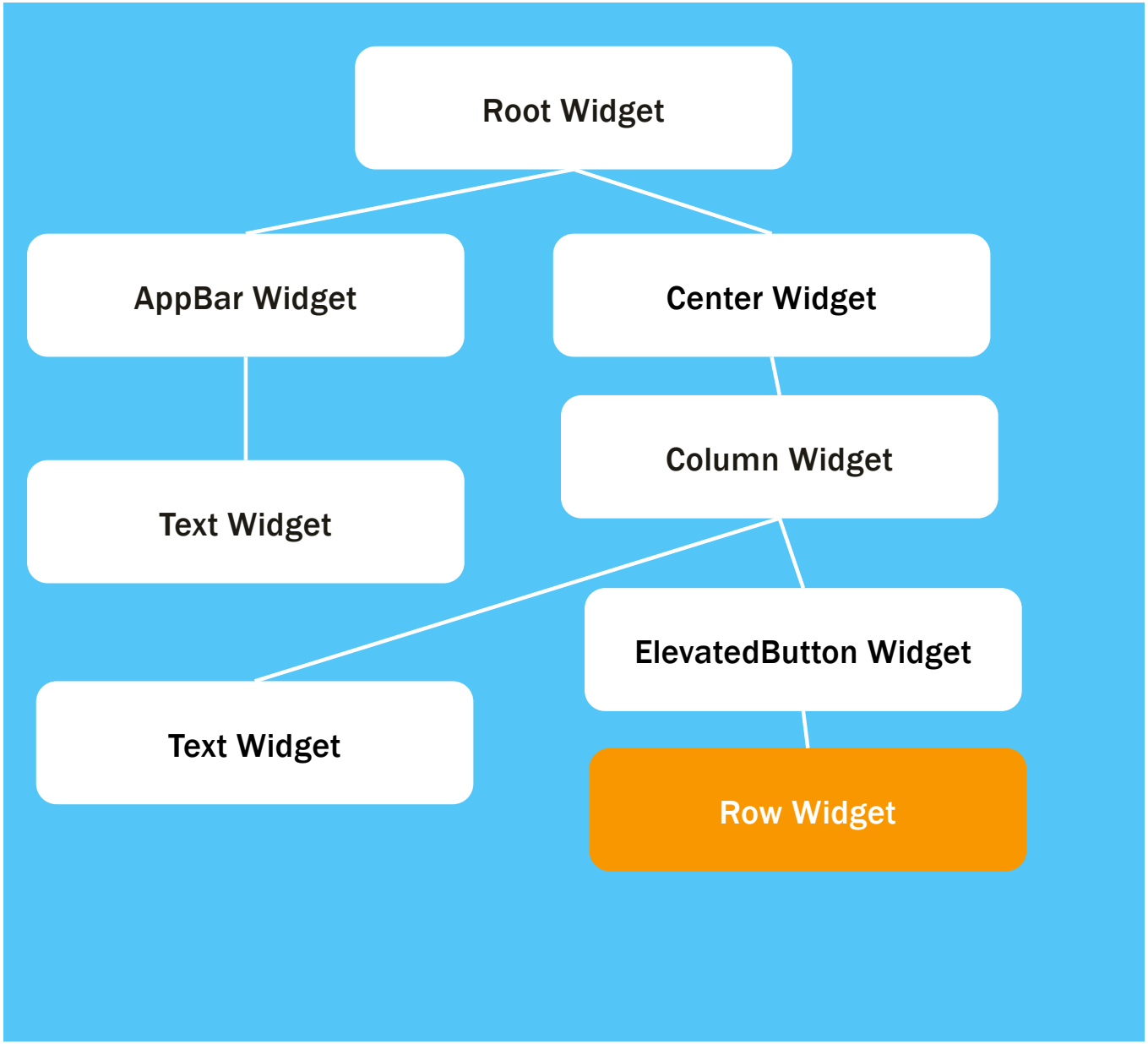
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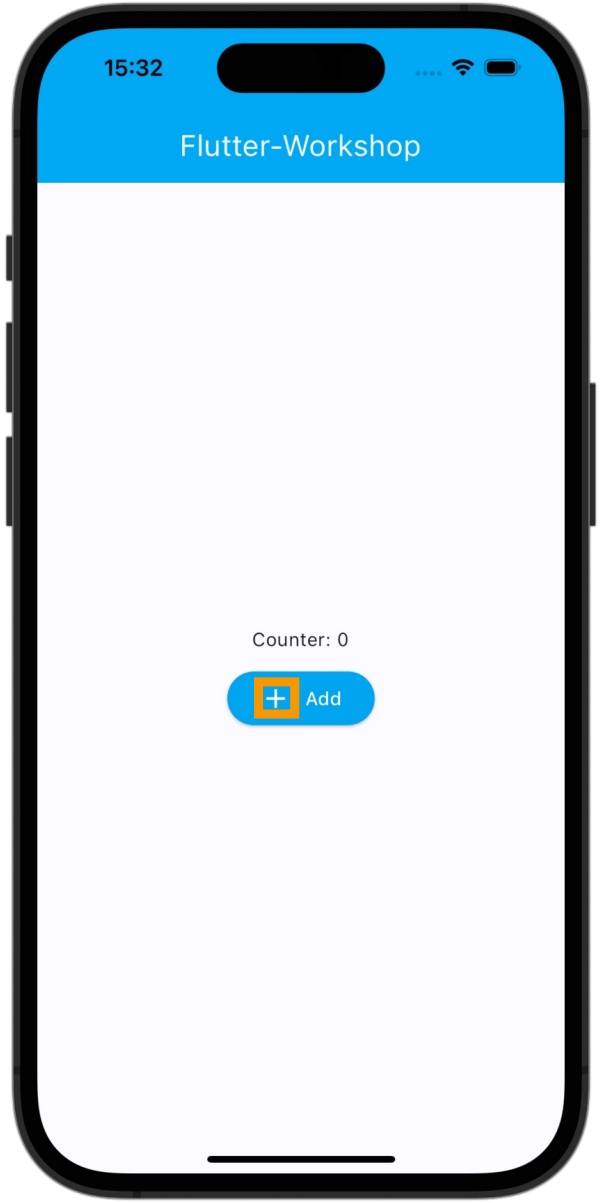
AppBar Widget
Center Widget
Text Widget
Column Widget
ElevatedButton Widget
Text Widget
Row Widget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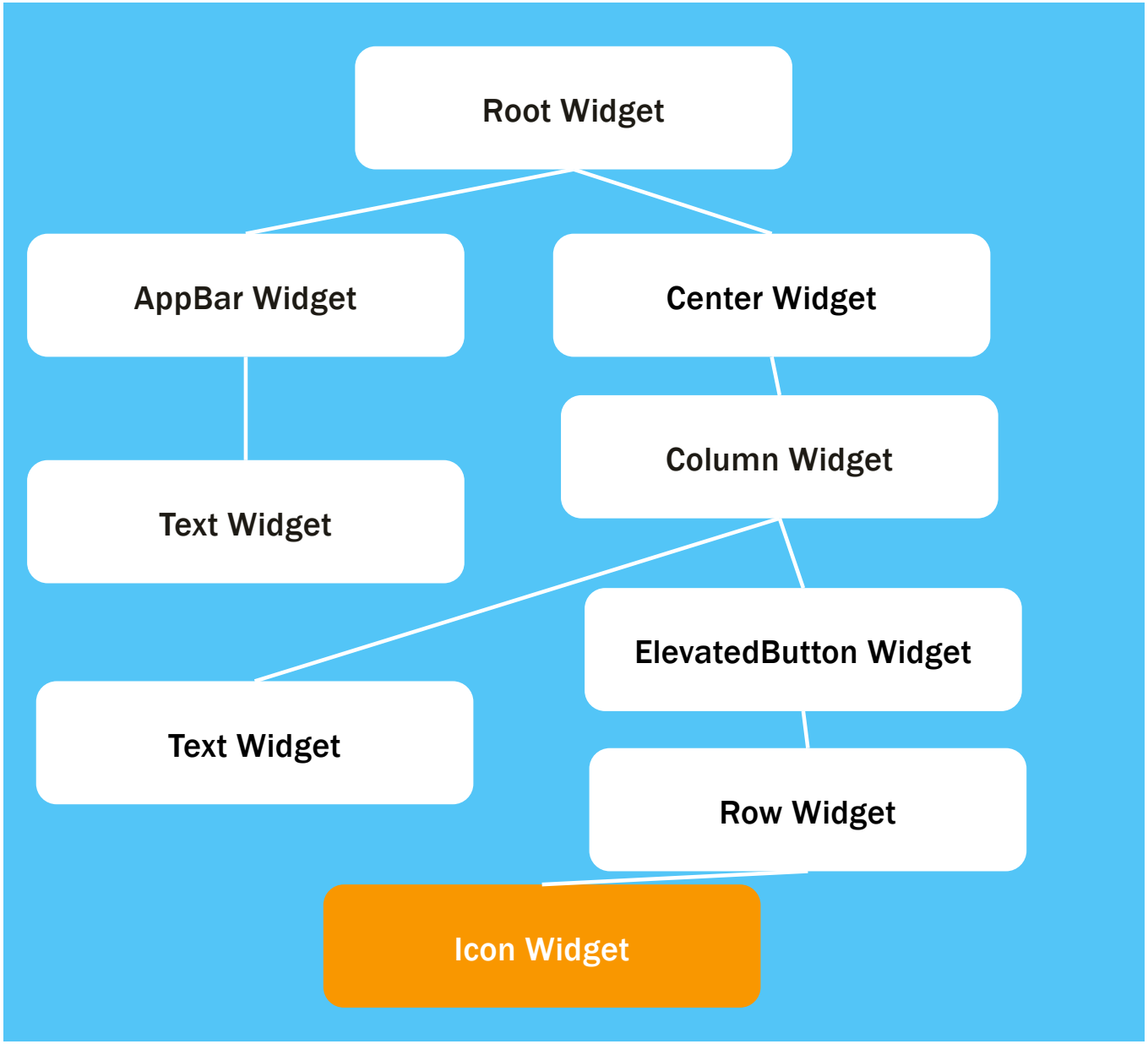
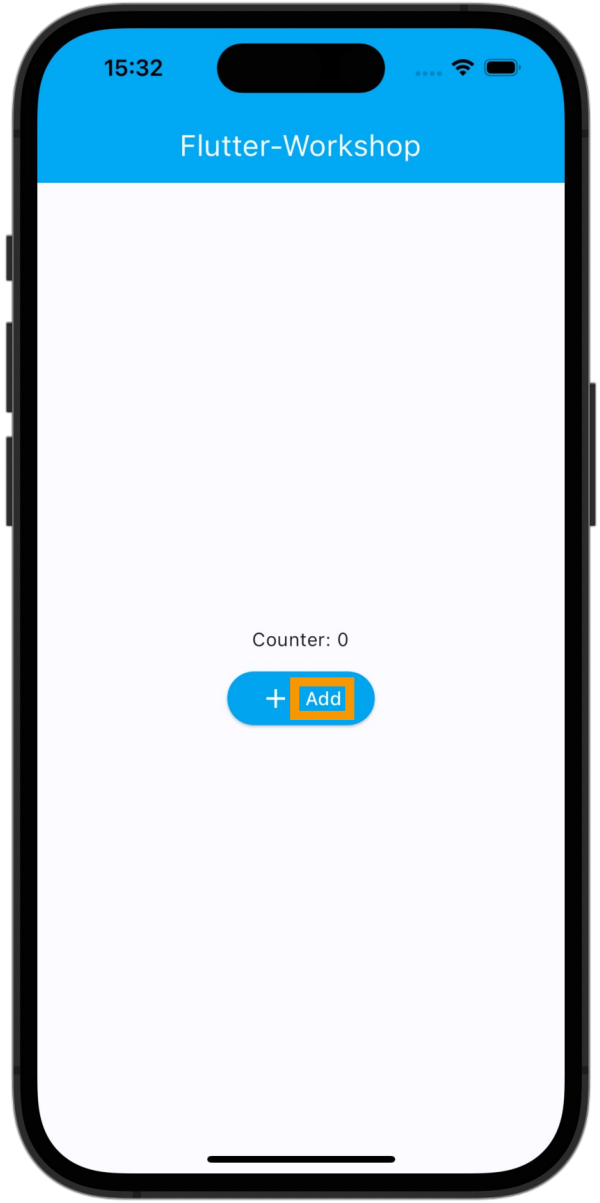

Root Widget
AppBar Widget
Center Widget
Text Widget
Column Widget
ElevatedButton Widget
Text Widget
Row Widget
Icon Widget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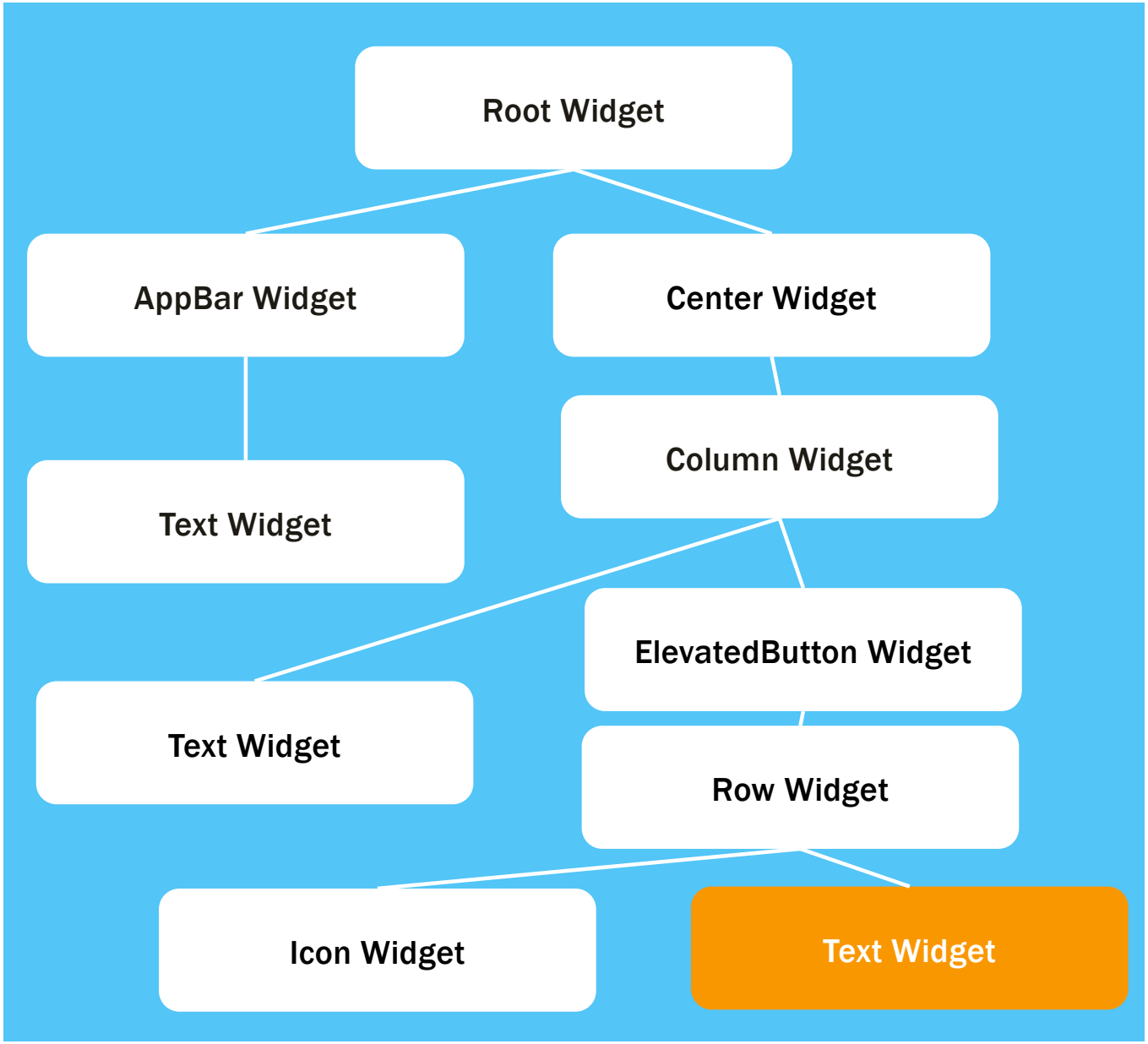
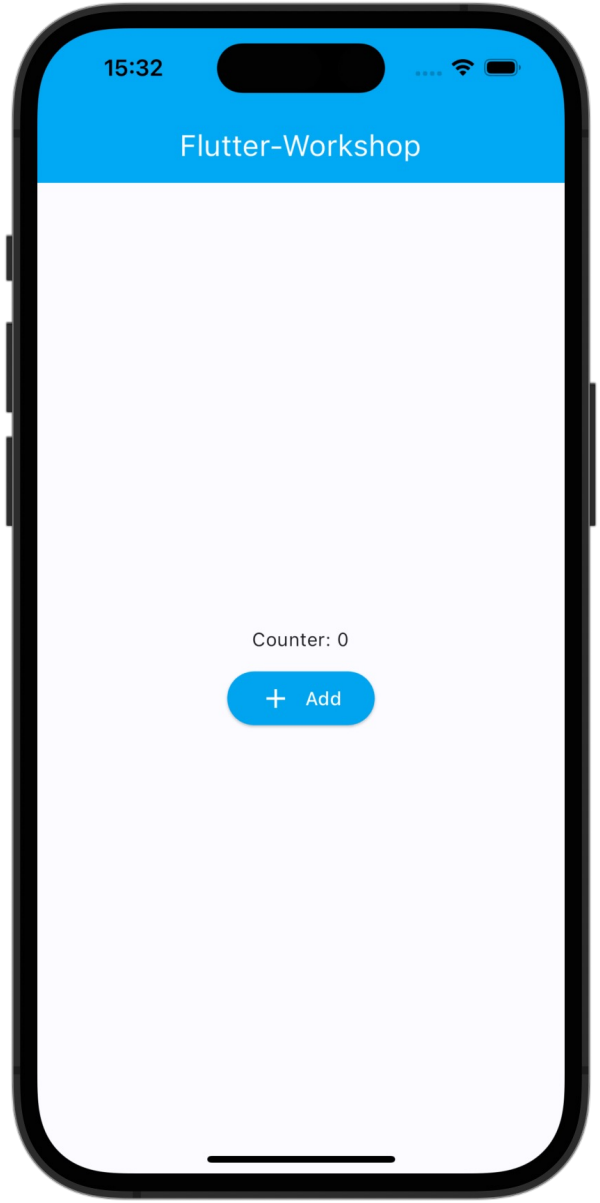

Root Widget
AppBar Widget
Center Widget
Text Widget
Column Widget
ElevatedButton Widget
Text Widget
Row Widget
Icon Widget
Text Widget


15:32
Flutter-Workshop
Counter: 0
Add


Root Widget
AppBar Widget
Center Widget
Text Widget
Column Widget
ElevatedButton Widget
Text Widget
Row Widget
This is often called a widget tree

Widget Properties

Properties

Text Widget	ElevatedButton Widget	Column Widget	AppBar Widget
style	style	mainAxisAlignment	title
textAlign	onPressed	crossAxisAlignment	backgroundColor
overflow	...	...	leading
maxLines			...
...			

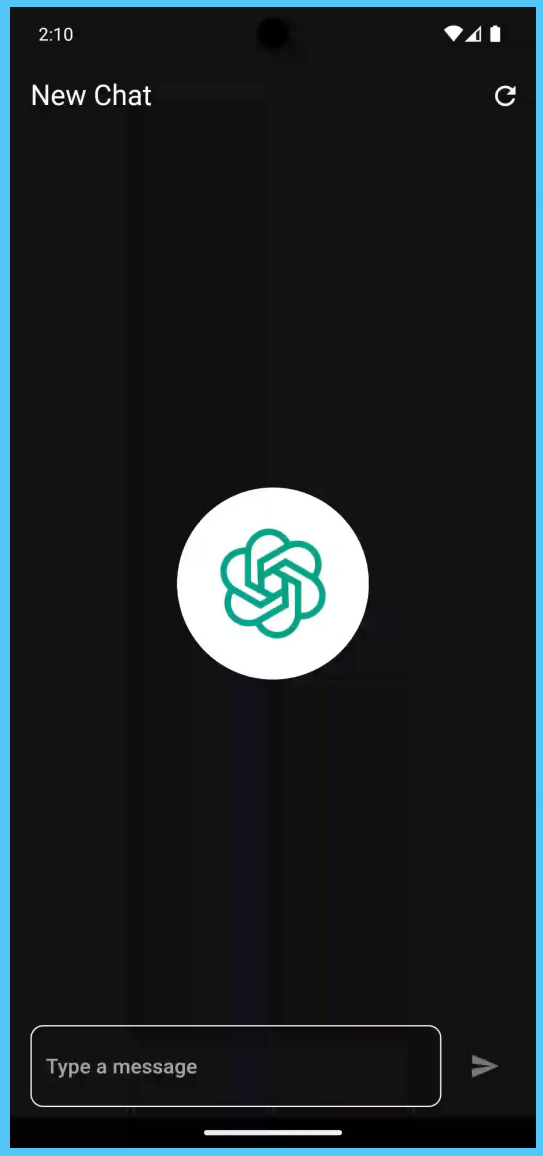
Summary

- “Everything is a widget”
- A page is just a tree of widgets (including itself)
- Widgets can be customized using their properties

Chat-GPT Clone

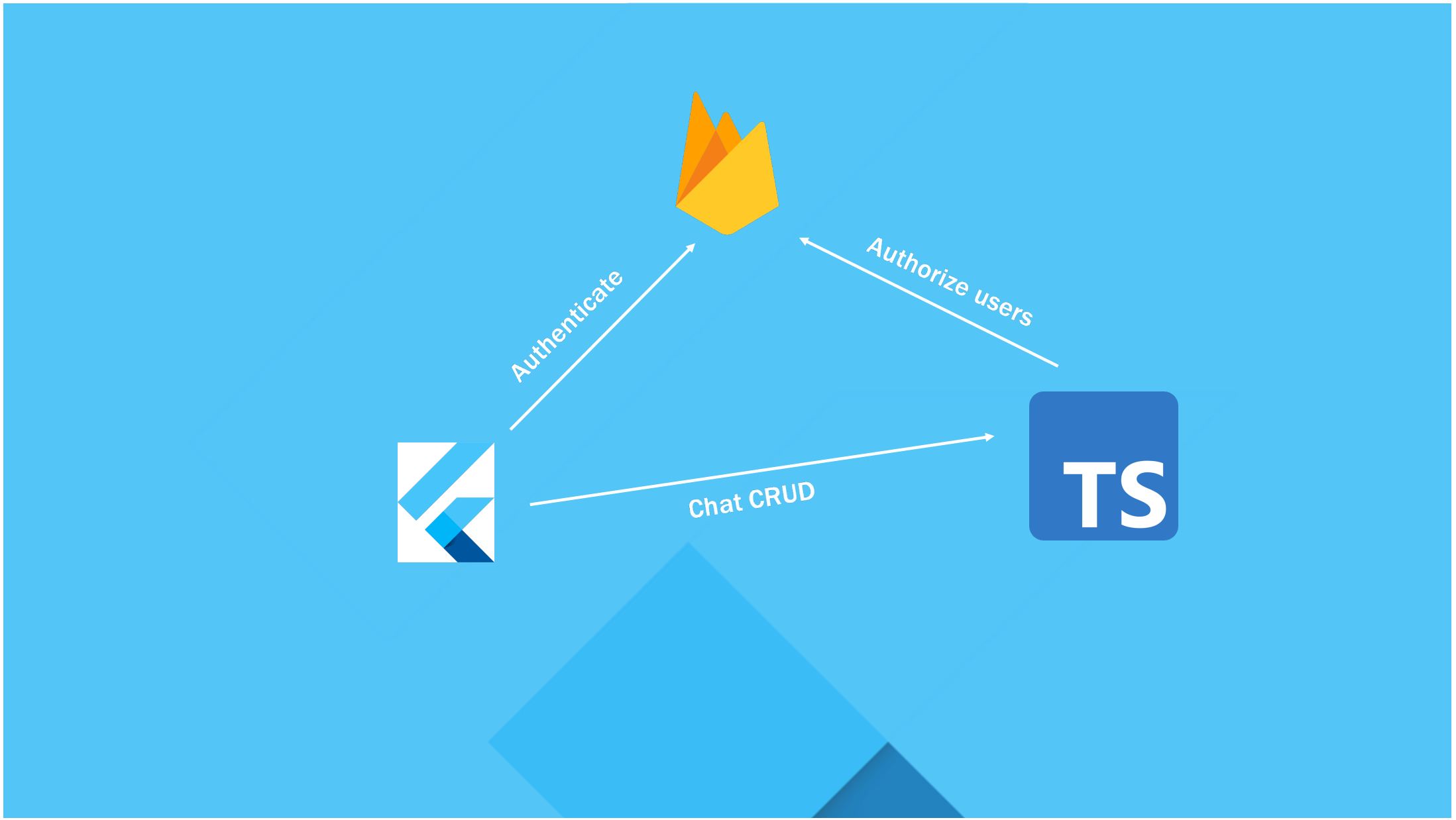
Demo

Chat-GPT Clone


2:10
New Chat
Type a message

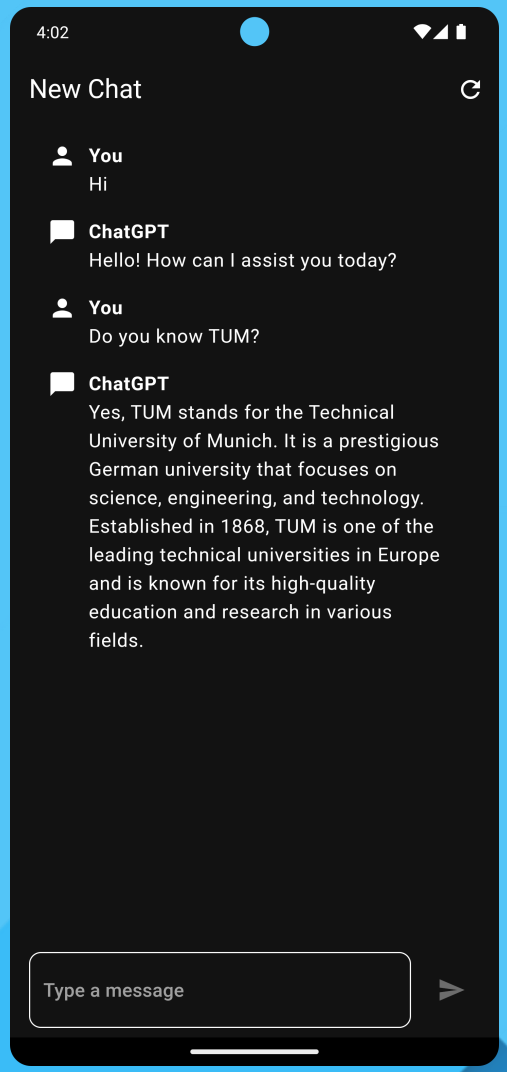
Architecture

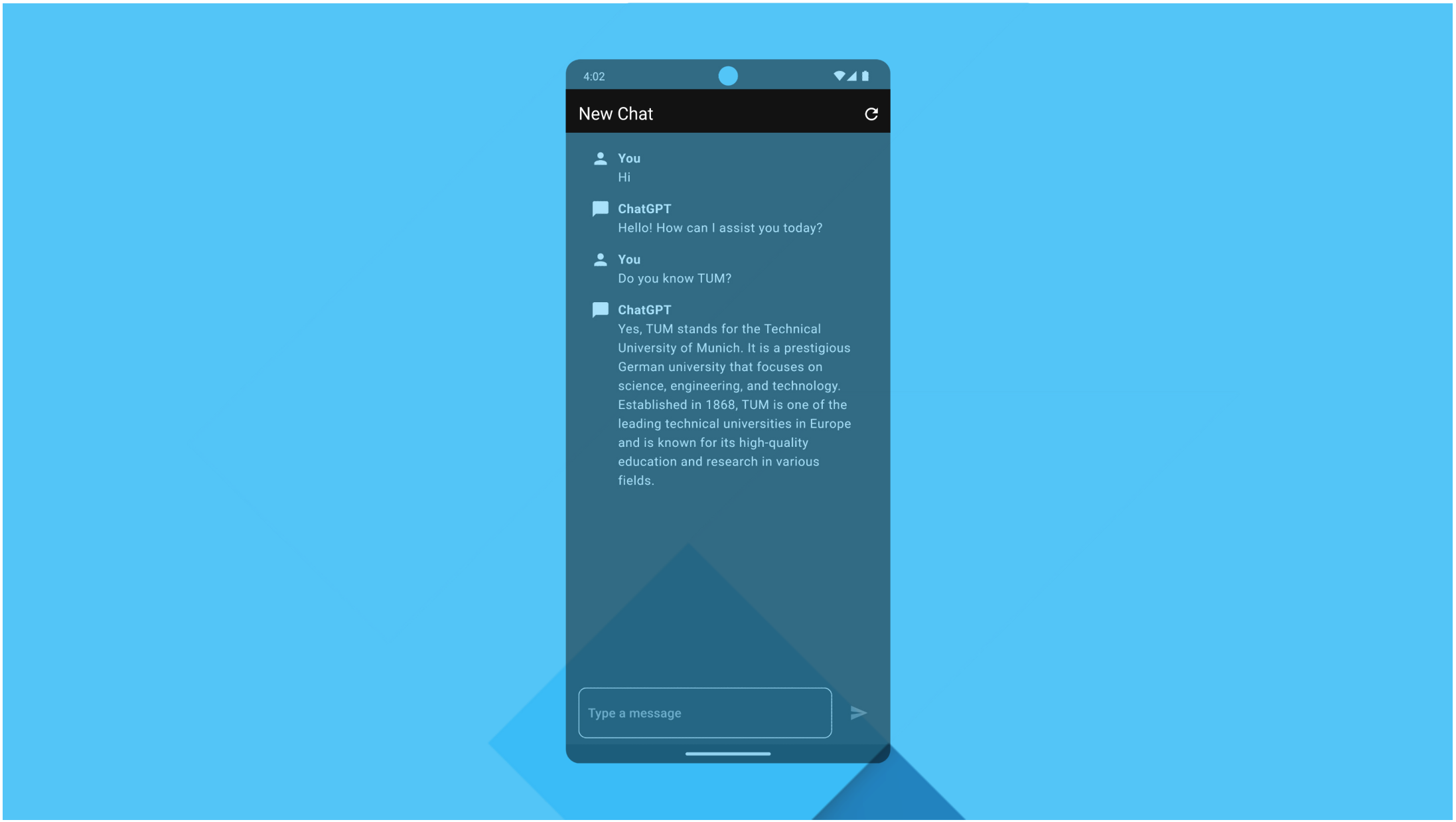
Chat-GPT Clone


Authenticate
Authorize users
Chat CRUD
TS

Design

Chat-GPT Clone


4:02
New Chat
You
Hi
ChatGPT
Hello! How can I assist you today?
You
Do you know TUM?
ChatGPT
Yes, TUM stands for the Technical University of Munich. It is a prestigious German university that focuses on science, engineering, and technology. Established in 1868, TUM is one of the leading technical universities in Europe and is known for its high-quality education and research in various fields.
Type a message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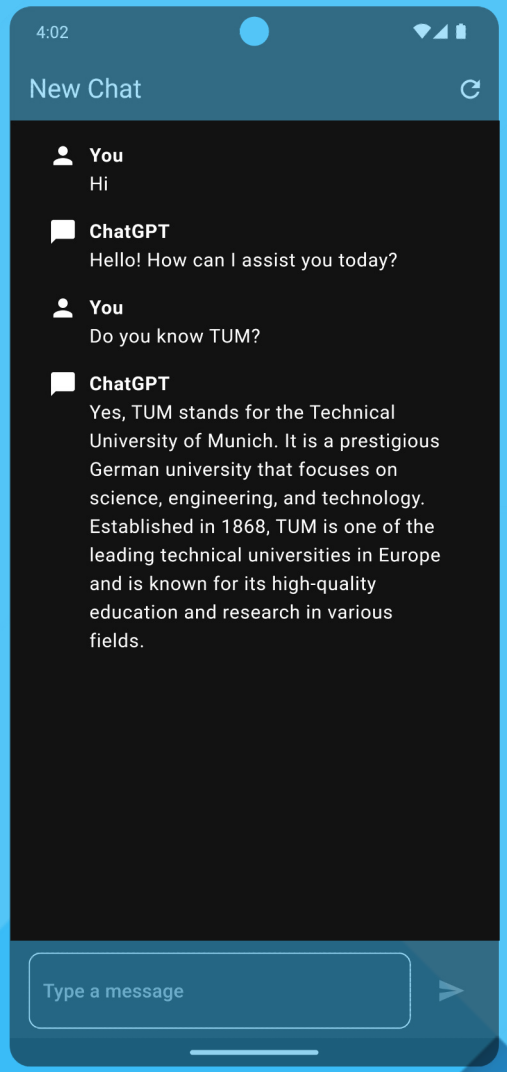
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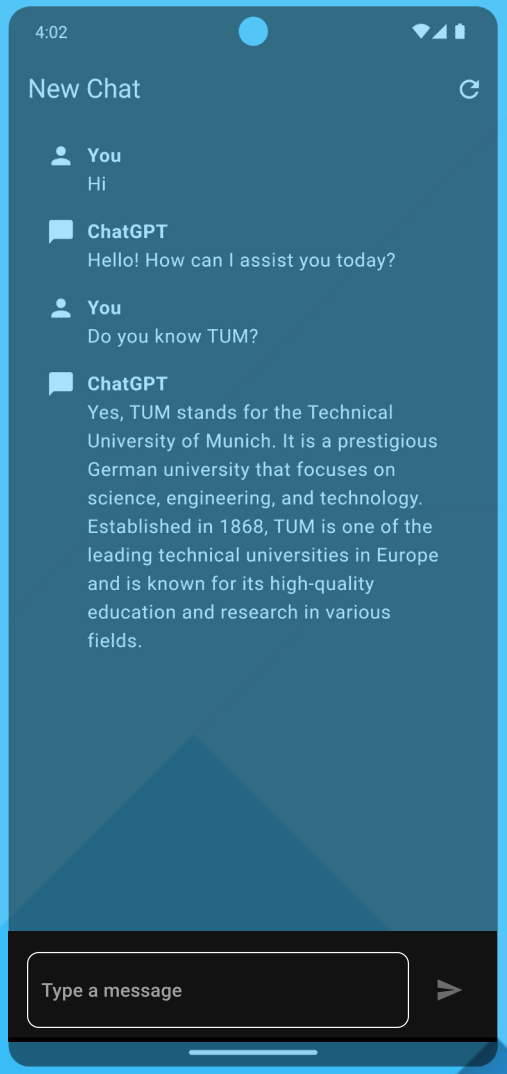
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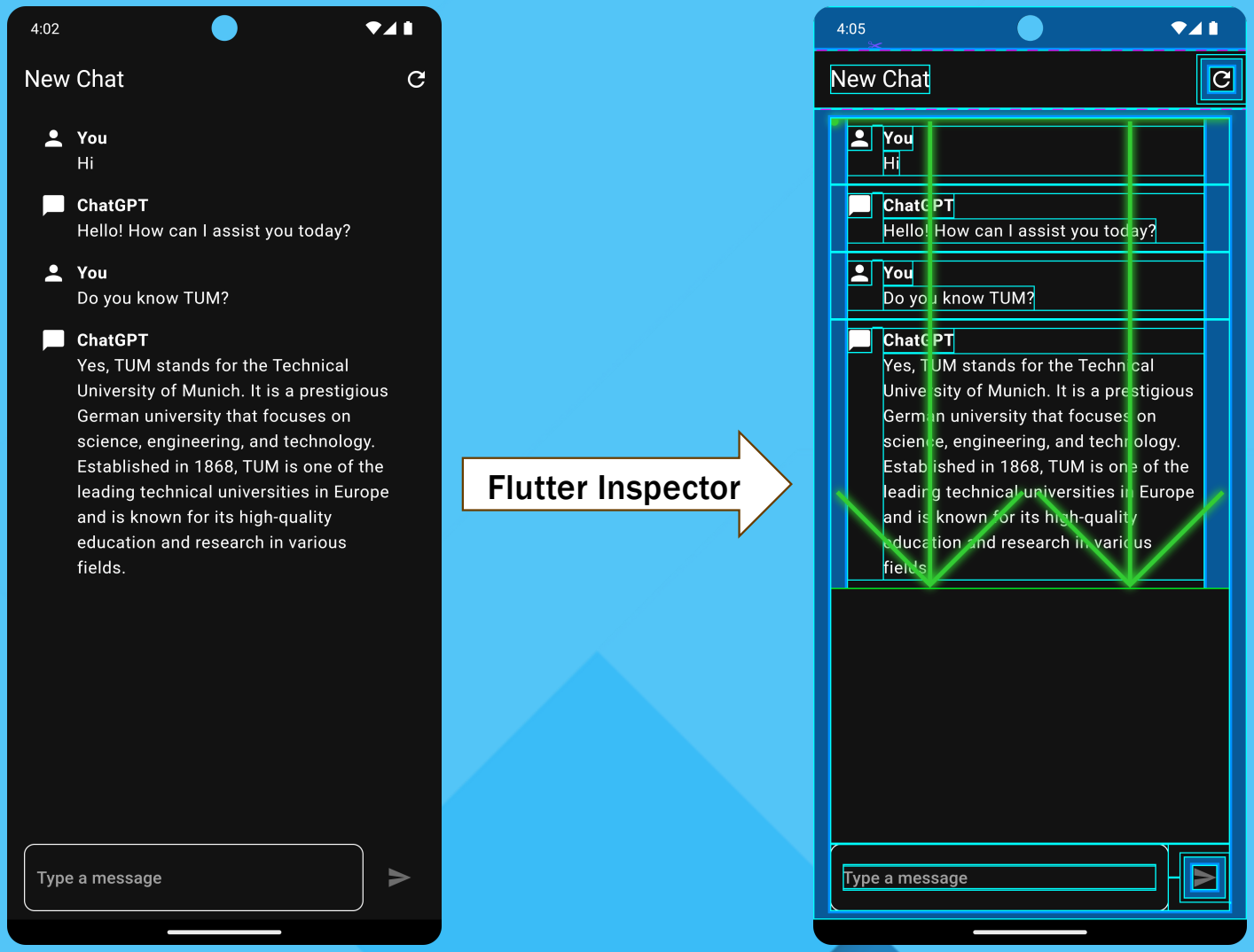
4:02
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Type a message
Flutter Inspector
4:05
New Chat
You
Hi
ChatGPT
Hello! How can I assist you today?
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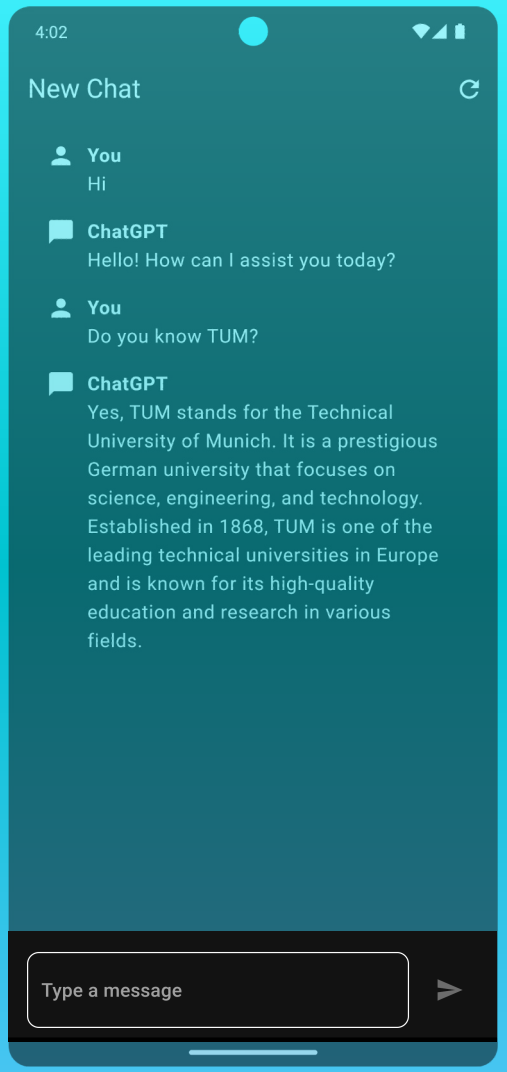
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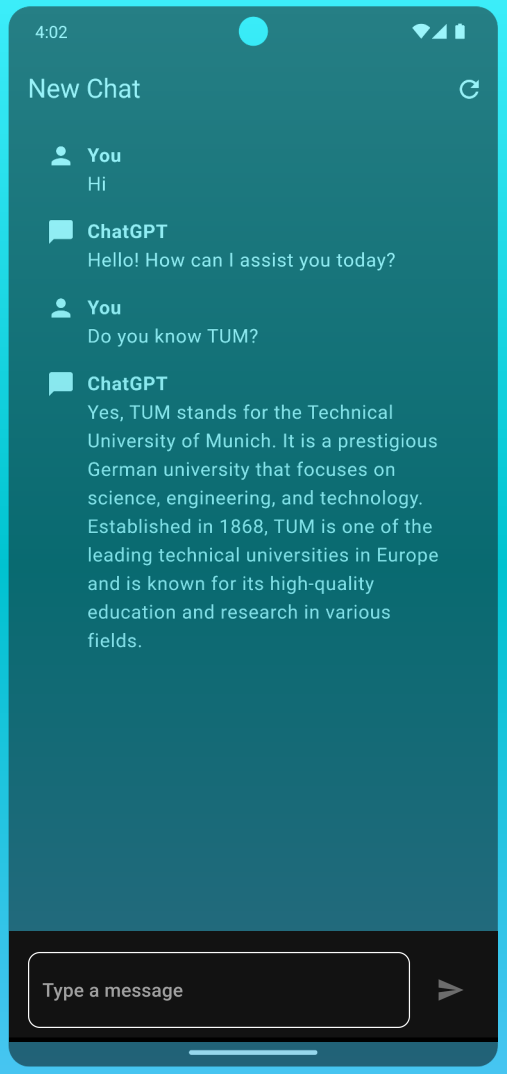
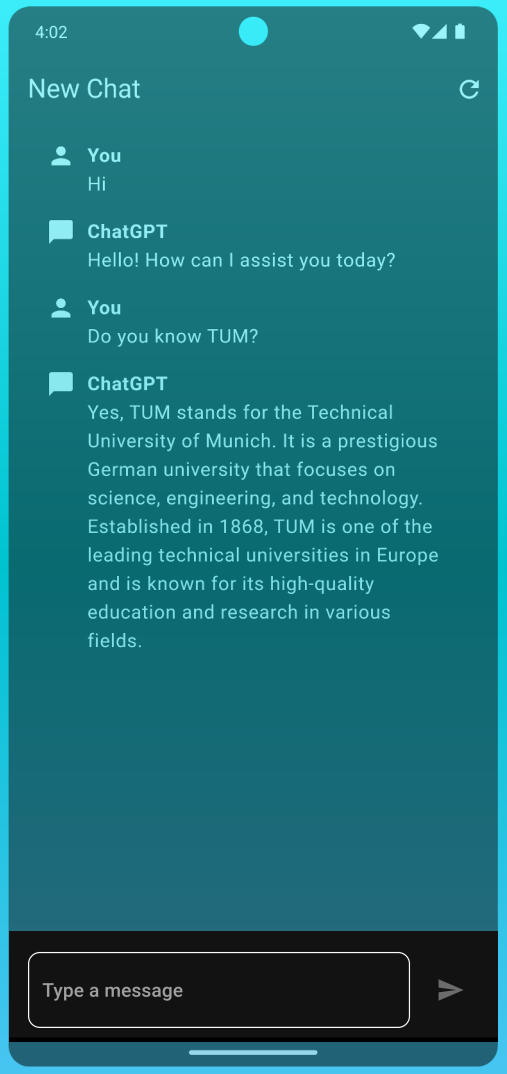



```dart
class ChatInput extends StatefulWidget {
  const ChatInput({super.key});

  @override
  State<ChatInput> createState() => _ChatInputState();
}

class _ChatInputState extends State<ChatInput> {
  final TextEditingController _inputController =
TextEditingController();

  @override
  void dispose() {
    super.dispose();
    _inputController.dispose();
  }

  @override
  Widget build(BuildContext context) {
    return Row(
      children: [],
    );
```

You can create widget boilerplate code using live templates in your editor

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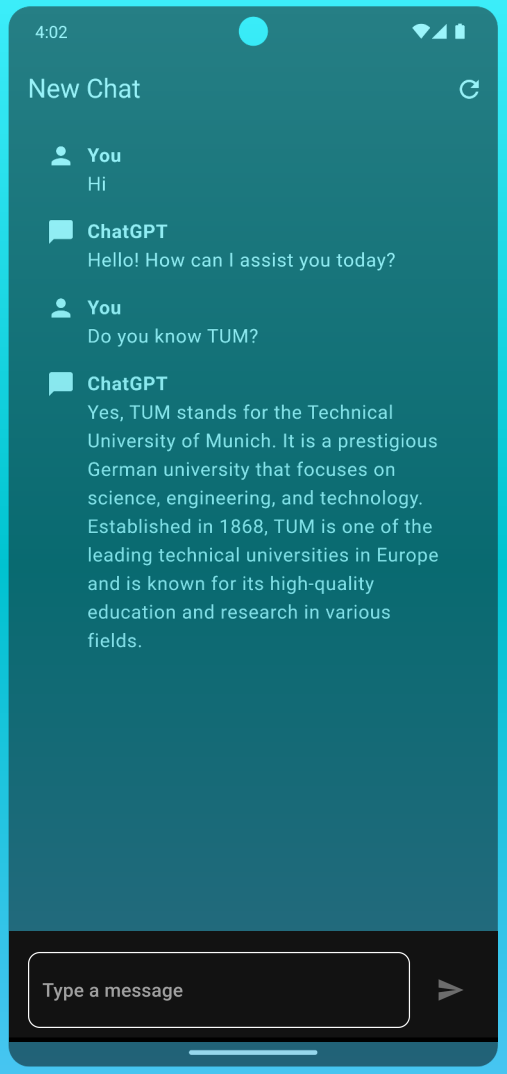
    _inputController.dispose();
  }

  @override
  Widget build(BuildContext context) {
    return Row(
      children: [],
    );
  }
}
```

👆 Widget has mutable state

👇 State of the ChatInput Widget

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  void dispose() {
    super.dispose();
    _inputController.dispose();
  }

  @override
  Widget build(BuildContext context) {
    return Row(
      children: [],
    );
  }
}
```
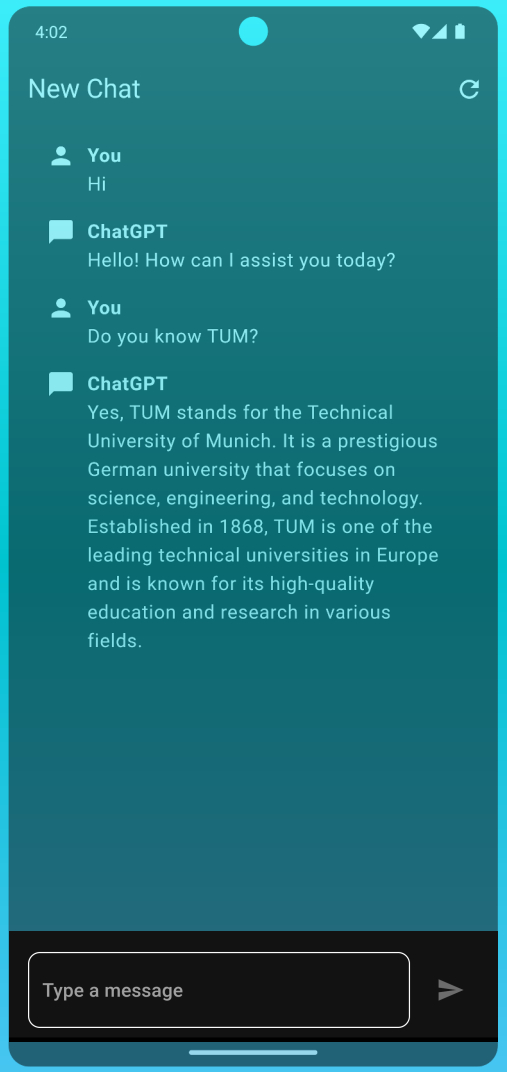
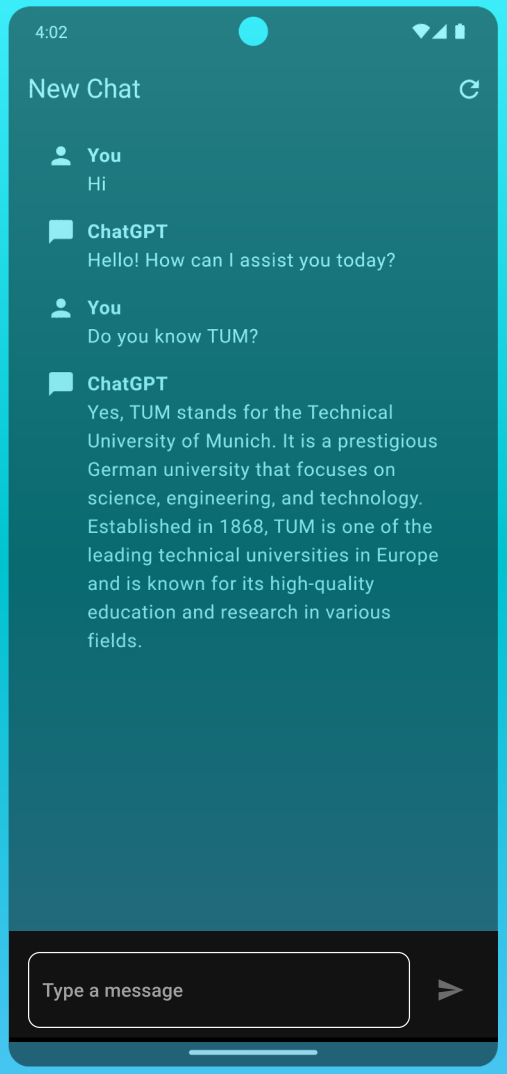

👆 Controller for the text field

👈 Called on end of widget lifecycle

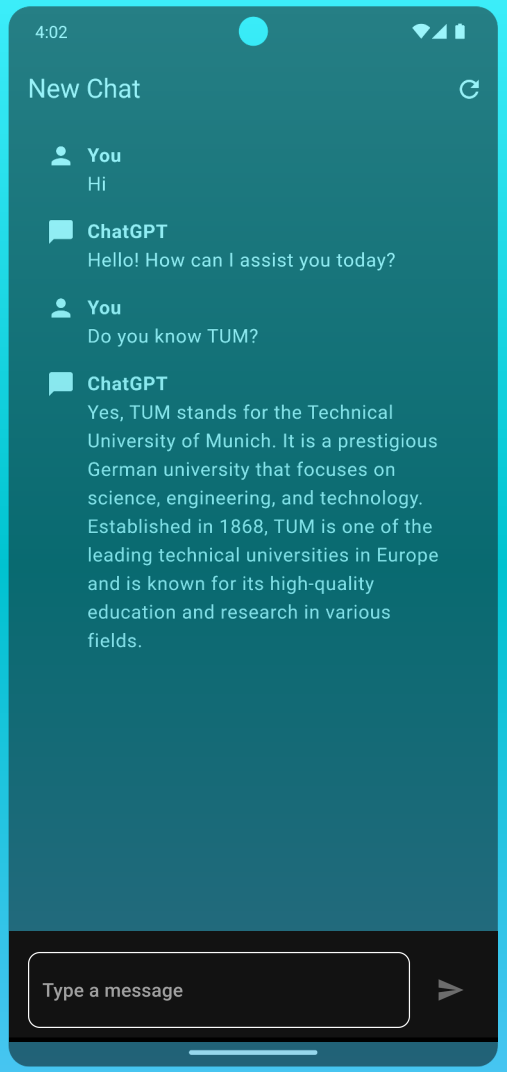
👈 Defines the content of the widget




```dart
@override
Widget build(BuildContext context) {
  return Row(
    children: [
      Expanded(  👈 Expand TextFormField to its maximum size
        child: TextFormField(
          controller: _inputController,
          decoration: const InputDecoration(
            hintText: 'Type a message',
          ),
        ),
      ),
      const SizedBox(  👈 Horizontal space
        width: 10,
      ),
      IconButton(
        onPressed: onSendPressed,  👈 Called when button is pressed
        icon: const Icon(Icons.send),
      )
    ],
  );
}
```




```dart
@override
Widget build(BuildContext context) {
  return Row(
    children: [
      Expanded(
        child: TextFormField(
          controller: _inputController,
          decoration: const InputDecoration(
            hintText: 'Type a message',
          ),
        ),
      ),
      const SizedBox(
        width: 10,
      ),
      if (_isSending)👈Show progress indicator while sending a message
        const CircularProgressIndicator()
      else
        IconButton(
          onPressed: onSendPressed,
          icon: const Icon(Icons.send),
        )
    ],
  );
}
```



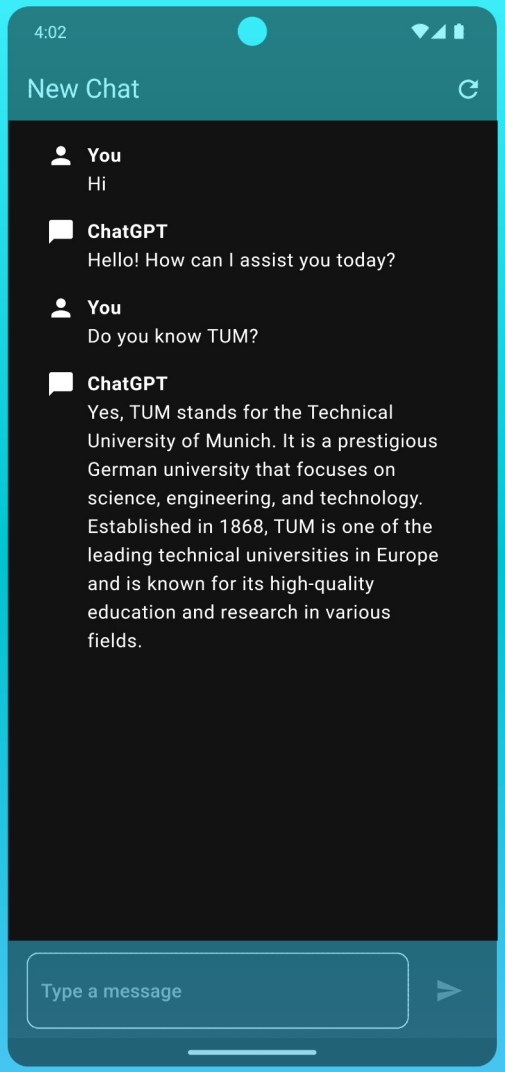

```dart
bool _isSending = false;

void onSendPressed() async {
  try {
    setState(() {
      _isSending = true;
    });
    ...
  } finally {
    setState(() {
      _isSending = false;
    });
  }
}
```

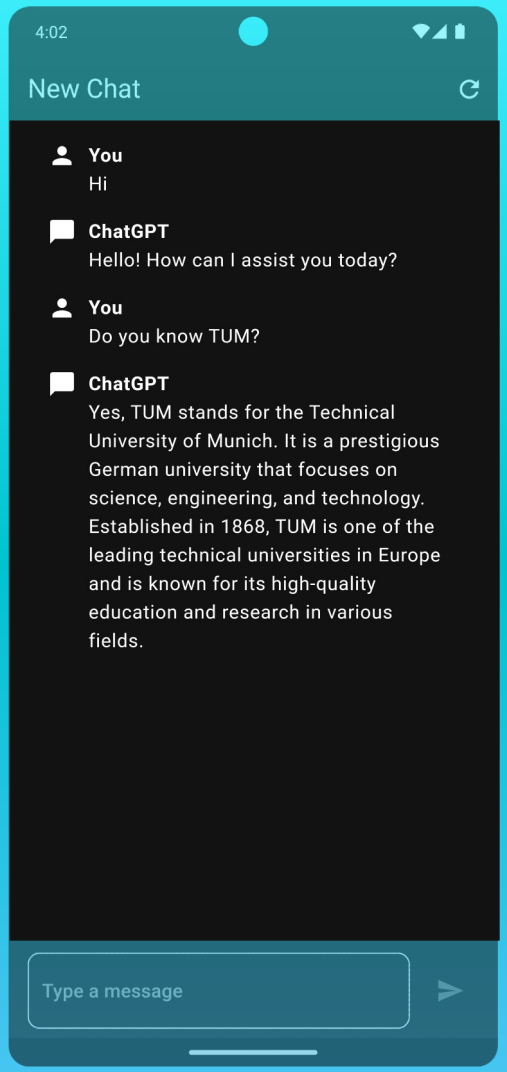
👈 Rebuild children with updated state

👈 Send message logic

👆 Set sending flag to false

```dart
class ChatInput extends StatefulWidget {
  const ChatInput({super.key});

  @override
  State<ChatInput> createState() => _ChatInputState();
}

class _ChatInputState extends State<ChatInput> {
  final TextEditingController _inputController =
TextEditingController();

  @override
  void dispose() {
    super.dispose();
    _inputController.dispose();
  }

  bool _isSending = false;

  void onSendPressed() async {
    try {
      setState(() {
        _isSending = true;
      });
      final chatProvider = context.read<ChatProvider>();
      await chatProvider.sendMessage(
        _inputController.text.trim(),
      );
      _inputController.clear();
      await chatProvider.requestResponse();
    } finally {
      setState(() {
        _isSending = false;
      });
    }
  }

@override
  Widget build(BuildContext context) {
    return Row(
      children: [
        Expanded(
          child: TextFormField(
            controller: _inputController,
            decoration: const InputDecoration(
              hintText: 'Type a message',
            ),
          ),
        ),
        const SizedBox(
          width: 10,
        ),
        if (_isSending)
          const CircularProgressIndicator()
        else
          ListenableBuilder(
            listenable: _inputController,
            builder: (context, _) {
              return IconButton(
                onPressed:
_inputController.text.isEmpty ? null : onSendPressed,
                icon: const Icon(Icons.send),
              );
            },
          ),
      ],
    );
  }
}
```

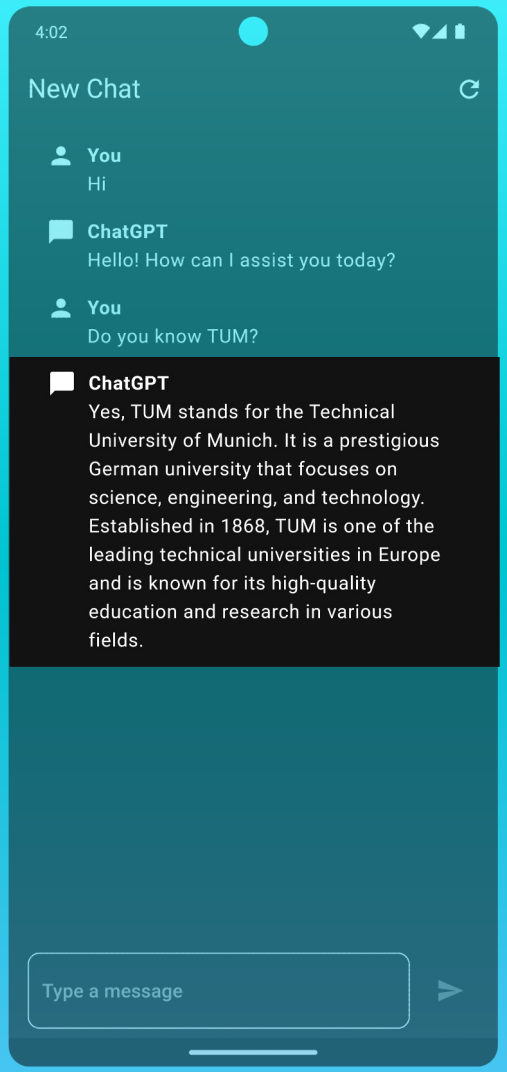

4:02
New Chat
You
Hi
ChatGPT
Hello! How can I assist you today?
You
Do you know TUM?
ChatGPT
Yes, TUM stands for the Technical University of Munich. It is a prestigious German university that focuses on science, engineering, and technology. Established in 1868, TUM is one of the leading technical universities in Europe and is known for its high-quality education and research in various fields.
Type a message



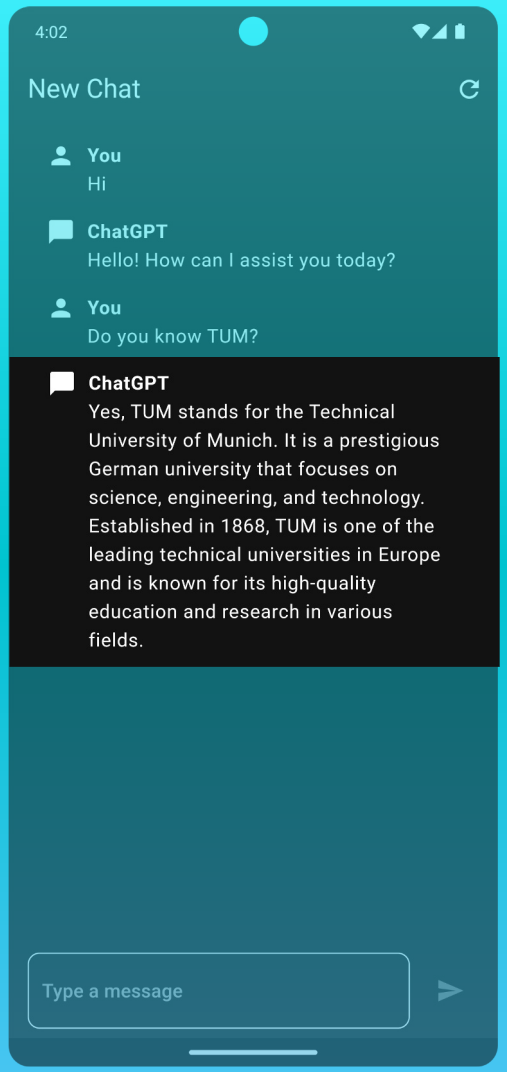

```dart
class ChatDisplay extends StatelessWidget {
  const ChatDisplay({super.key, required this.chat});

  final Chat chat;

  @override
  Widget build(BuildContext context) {
    return ListView.builder(
      itemBuilder: (context, index) {
        final message = chat.messages[index];
        return ChatMessageTile(message: message);
      },
      itemCount: chat.messages.length,
    );
  }
}
```

👆 Widget has no mutable state

👈 Build Widget for each message




```dart
@override
Widget build(BuildContext context) {
  return ListTile(
    title: Row(
      crossAxisAlignment: CrossAxisAlignment.start,
      children: [
        if (message.sender == Sender.user)
          const Icon(Icons.person)
        else
          const Icon(Icons.chat_bubble),
        const SizedBox(
          width: 10,
        ),
        Expanded(
          child: Column(
            crossAxisAlignment: CrossAxisAlignment.start,
            children: [
              Text(
                message.sender.displayText,
                style: const TextStyle(
                  fontWeight: FontWeight.bold,
                ),
              ),
              Text(message.text),
            ],
          ),
        ),
      ],
    ),
  );
}
```

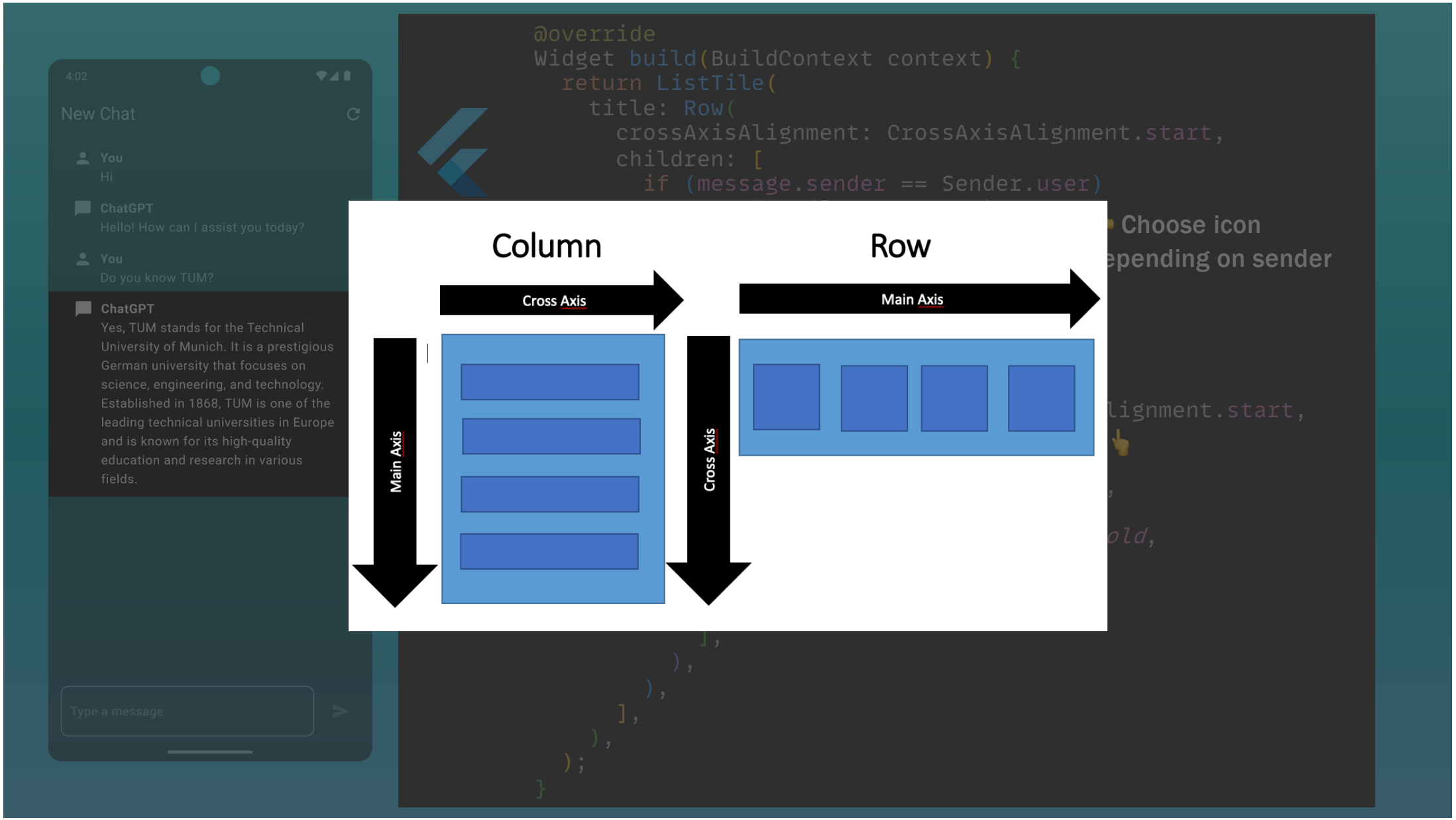



```dart
@override
Widget build(BuildContext context) {
  return ListTile(
    title: Row(
      crossAxisAlignment: CrossAxisAlignment.start,
      children: [
        if (message.sender == Sender.user)
          const Icon(Icons.person)
        else
          const Icon(Icons.chat_bubble),
        const SizedBox(
          width: 10,
        ),
        Expanded(
          child: Column(
            crossAxisAlignment: CrossAxisAlignment.start,
            children: [
              Text(
                message.sender.displayText,
                style: const TextStyle(
                  fontWeight: FontWeight.bold,
                ),
              ),
              Text(message.text),
            ],
          ),
        ),
      ],
    ),
  );
}
```

👈 Choose icon depending on sender

👈 Horizontal space

Align Texts to the left 👆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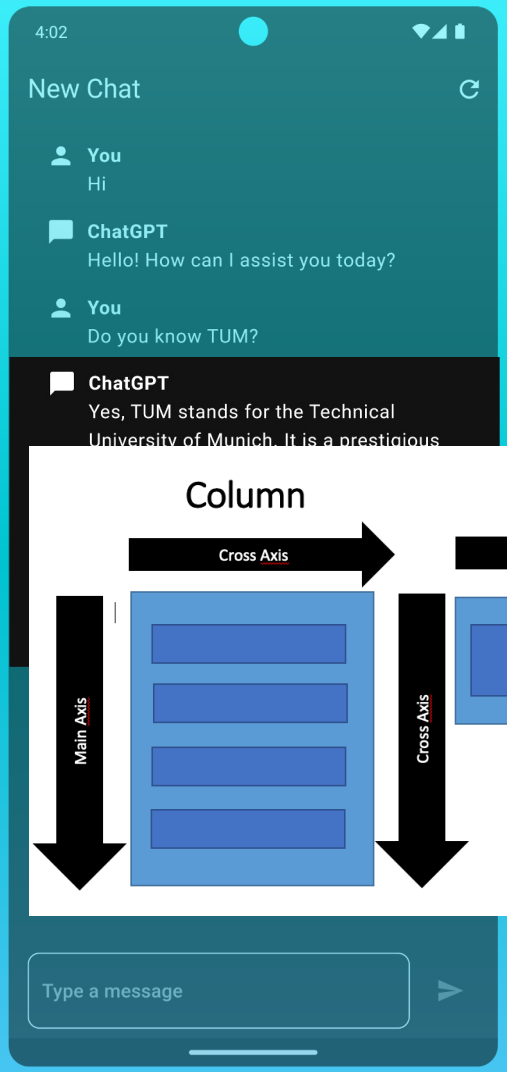
Hello! How can I assist you today?
You
Do you know TUM?
ChatGPT
Yes, TUM stands for the Technical University of Munich. It is a prestigious German university that focuses on science, engineering, and technology. Established in 1868, TUM is one of the leading technical universities in Europe and is known for its high-quality education and research in various fields.
Type a message
@override
Widget build(BuildContext context) {
return ListTile(
title: Row(
crossAxisAlignment: CrossAxisAlignment.start,
children: [
if (message.sender == Sender.user)
Choose icon
epending on sender
lignment.start,
old,
Column
Row
Cross Axis
Main Axis
Main Axis
Cross Axis

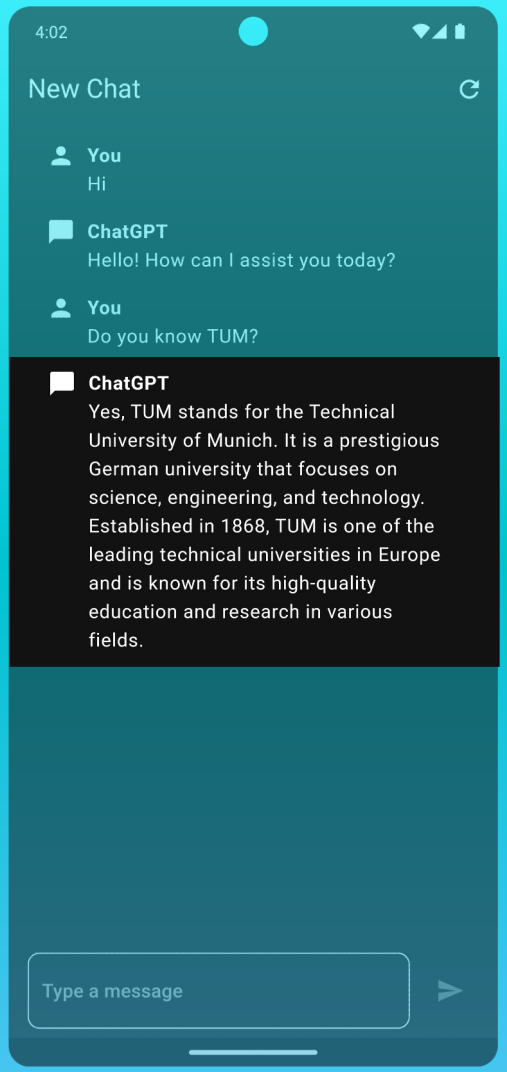



```dart
@override
Widget build(BuildContext context) {
  return ListTile(
    title: Row(
      crossAxisAlignment: CrossAxisAlignment.start,
      children: [
        if (message.sender == Sender.user)
          const Icon(Icons.person)
        else
          const Icon(Icons.chat_bubble),
        const SizedBox(
          width: 10,
        ),
        Expanded(
          child: Column(
            crossAxisAlignment: CrossAxisAlignment.start,
            children: [
              Text(
                message.sender.displayText,
                style: const TextStyle(
                  fontWeight: FontWeight.bold,
                ),
              ),
              Text(message.text),
            ],
          ),
        ),
      ],
    ),
  );
}
```

👈 Choose icon depending on sender

👈 Horizontal space

Align Texts to the left 👆




```dart
@override
Widget build(BuildContext context) {
  return ListTile(
    title: Row(
      crossAxisAlignment: CrossAxisAlignment.start,
      children: [
        if (message.sender == Sender.user)
          const Icon(Icons.person)
        else
          const Icon(Icons.chat_bubble),
        const SizedBox(
          width: 10,
        ),
        Expanded(
          child: Column(
            crossAxisAlignment: CrossAxisAlignment.start,
            children: [
              Text(
                message.sender.displayText,
                style: const TextStyle(
                  fontWeight: FontWeight.bold,
                ),
              ),
              Text(message.text),
            ],
          ),
        ),
      ],
    ),
  );
}
```

👈 Choose icon depending on sender

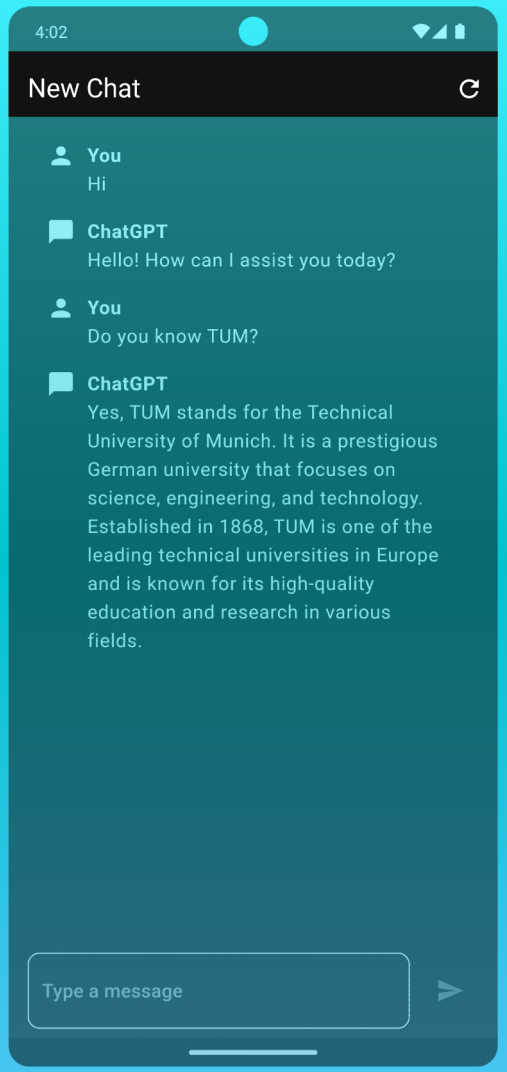
👈 Horizontal space

Align Texts to the left 👆

Make sender name bold 👆

```dart
class ChatDisplay extends StatelessWidget {
  const ChatDisplay({super.key, required this.chat});

  final Chat chat;

  @override
  Widget build(BuildContext context) {
    if (chat.messages.isEmpty) {
      return Center(
        child: ConstrainedBox(
          constraints: const BoxConstraints(
            maxWidth: 300,
          ),
          child: const FractionallySizedBox(
            widthFactor: 0.5,
            child: Image(
              image:
AssetImage('assets/images/chatgpt.png'),
            ),
          ),
        ),
      );
    }
    return ListView.builder(
      itemBuilder: (context, index) {
        final message = chat.messages[index];
        return ChatMessageTile(message: message);
      },
      itemCount: chat.messages.length,
    );
  }
}
```

```dart
class ChatMessageTile extends StatelessWidget {
  const ChatMessageTile({
    super.key,
    required this.message,
  });

  final ChatMessage message;

  @override
  Widget build(BuildContext context) {
    return ListTile(
      title: Row(
        crossAxisAlignment: CrossAxisAlignment.start,
        children: [
          if (message.sender == Sender.user)
            const Icon(Icons.person)
          else
            const Icon(Icons.chat_bubble),
          const SizedBox(
            width: 10,
          ),
          Expanded(
            child: Column(
              crossAxisAlignment:
CrossAxisAlignment.start,
              children: [
                Text(
                  message.sender.displayText,
                  style: const TextStyle(
                    fontWeight: FontWeight.bold,
                  ),
                ),
                Text(message.text),
              ],
            ),
          ),
        ],
      ),
    );
  }
}
```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ChatGPT
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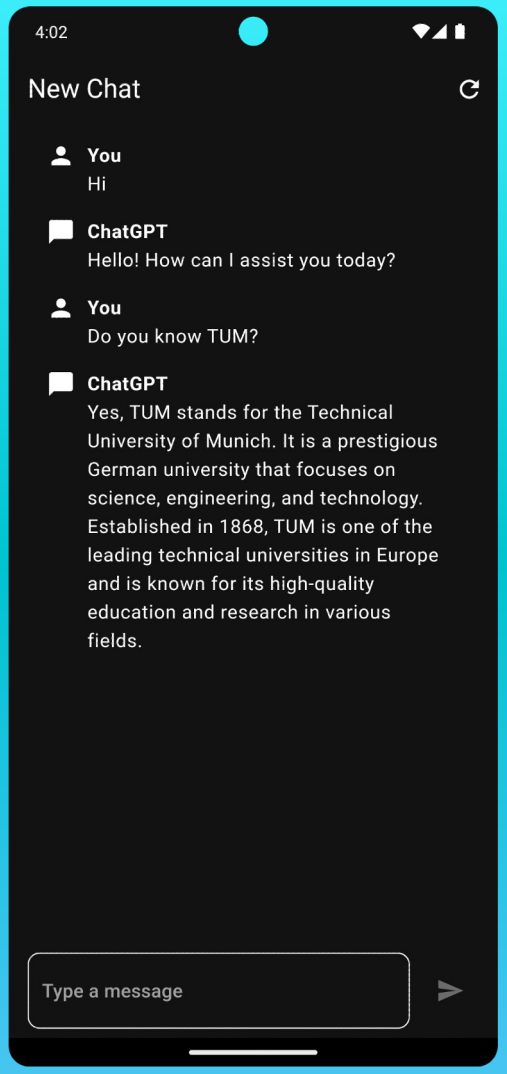
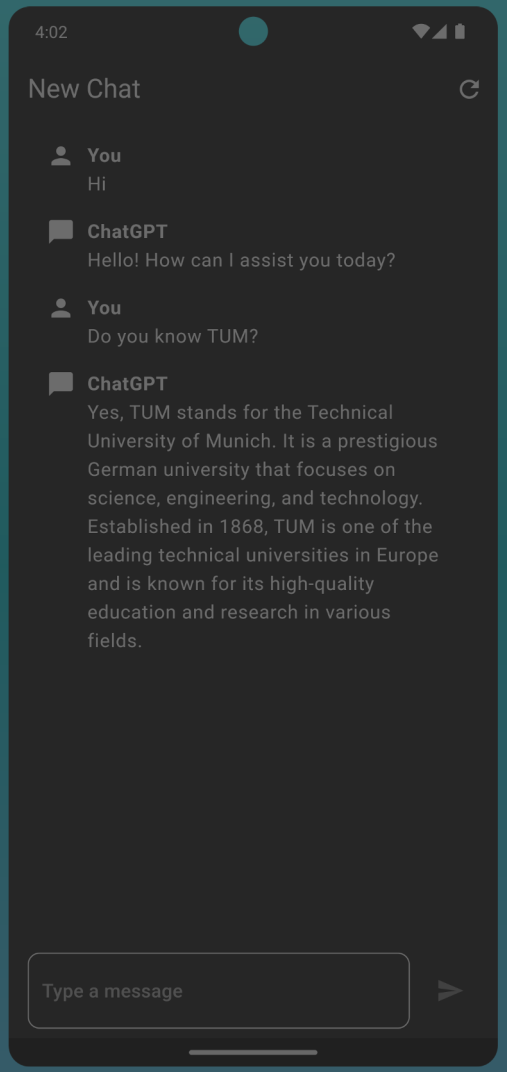
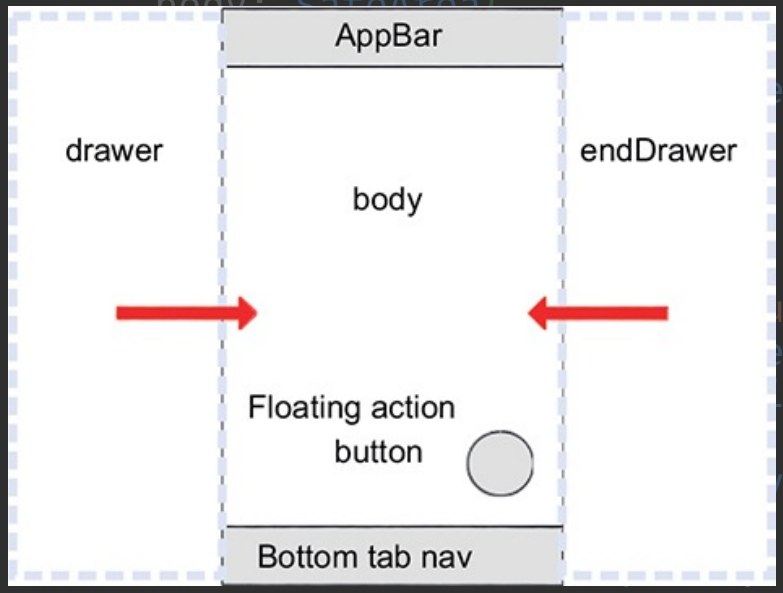
Yes, TUM stands for the Technical University of Munich. It is a prestigious German university that focuses on science, engineering, and technology. Established in 1868, TUM is one of the leading technical universities in Europe and is known for its high-quality education and research in various fields.
Type a message

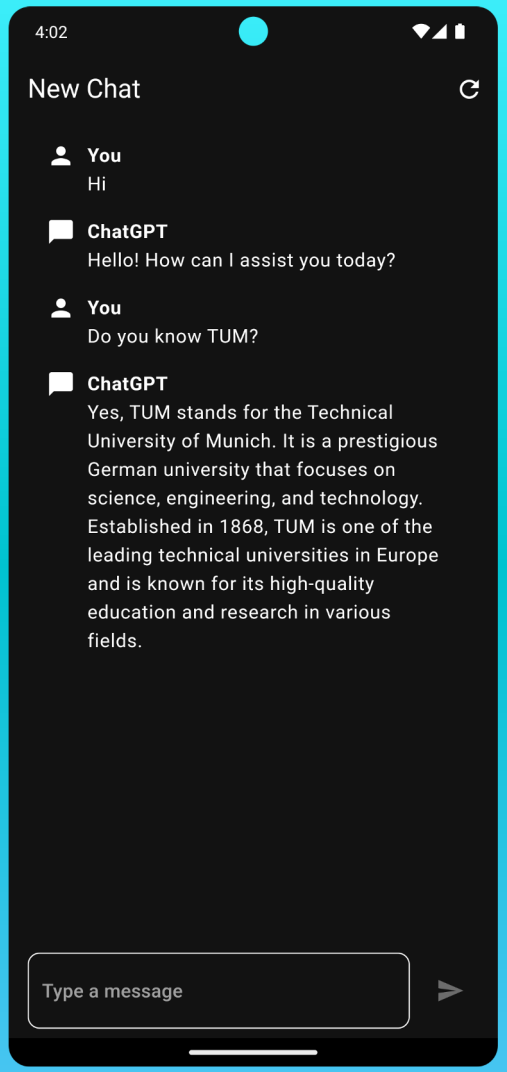



```dart
class Home extends StatefulWidget {
  const Home({super.key});

  @override
  State<Home> createState() => _HomeState();
}

class _HomeState extends State<Home> {
  @override
  Widget build(BuildContext context) {

  }

  AppBar buildAppBar(Chat? chat, BuildContext context) {
    ...
  }
}
```




```dart
@override
Widget build(BuildContext context) {
  final chatProvider = context.watch<ChatProvider>();
  final chat = chatProvider.currentChat;
  return Scaffold( 👈 Places widgets in a predefined layout
    appBar: buildAppBar(chat, context),
    body: SafeArea(
                                    ts.symmetric(horizontal:
                                    ll
                                    r(
                                    rcularProgressIndicator(),
                                    (chat: chat),
          ],
        ),
      ),
    ),
  );
}
```





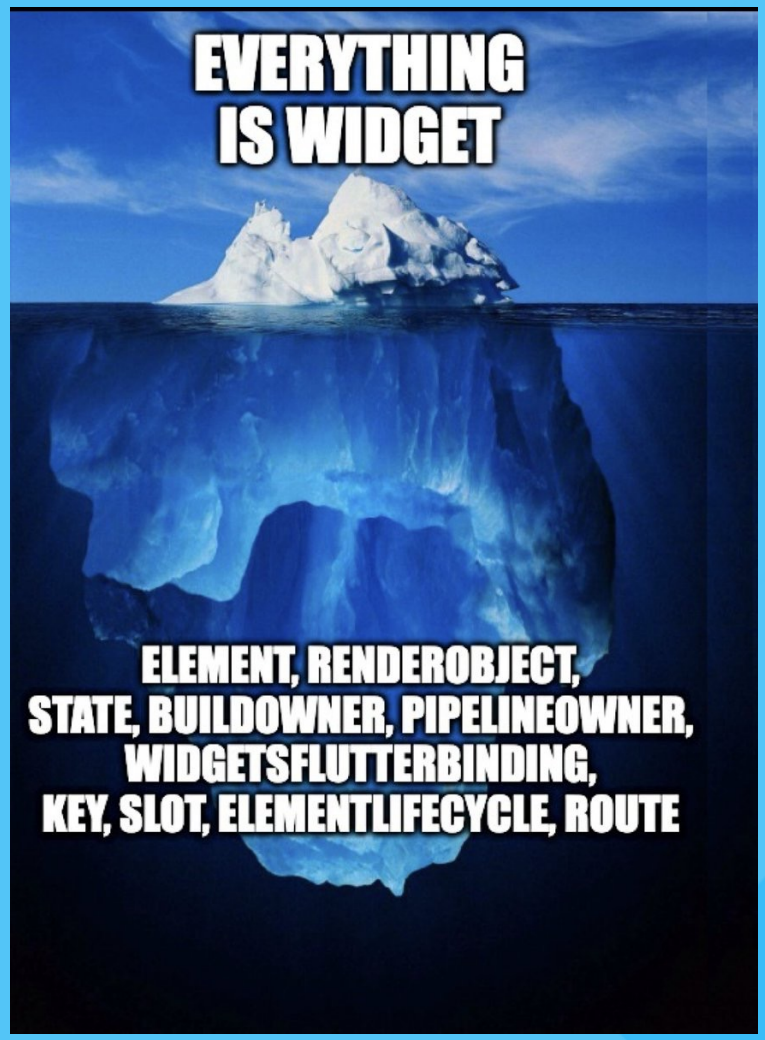

```dart
@override
Widget build(BuildContext context) {
  final chatProvider = context.watch<ChatProvider>();
  final chat = chatProvider.currentChat;
  return Scaffold( 👈 Places widgets in a predefined layout
    appBar: buildAppBar(chat, context),
    body: SafeArea(
      child: Padding( 👈 Applies padding to child
        padding: const EdgeInsets.symmetric(horizontal:
16, vertical: 8),
        child: Column(
          children: [
            Expanded(
              child: chat == null 👈 Show loading indicator
                  ? const Center(
                      child: CircularProgressIndicator(),
                    )
                  : ChatDisplay(chat: chat),
            ),
            const ChatInput(),
          ],
        ),
      ),
    ),
  );
}
```

```dart
class Home extends StatefulWidget {
  const Home({super.key});

  @override
  State<Home> createState() => _HomeState();
}

class _HomeState extends State<Home> {
  @override
  void initState() {
    super.initState();
    WidgetsBinding.instance.addPostFrameCallback((_) {
      final authProvider = context.read<AuthProvider>();
      VoidCallback? listener;
      listener = () {
        if (authProvider.currentUser == null) {
          return;
        }
        final chatProvider = context.read<ChatProvider>();
        chatProvider.loadCurrentOrCreateChat();
        authProvider.removeListener(listener!);
      };
      authProvider.addListener(listener);
    });
  }

  AppBar buildAppBar(Chat? chat, BuildContext context) {
    return AppBar(
      title: Text(chat?.title ?? 'ChatGPT'),
      actions: [
        IconButton(
          onPressed: () async {
            await
context.read<ChatProvider>().startNewChat();
          },
          icon: const Icon(Icons.refresh),
        ),
      ],
    );
  }
}
```

```dart
@override
  Widget build(BuildContext context) {
    final authProvider =
context.watch<AuthProvider>();
    if (authProvider.currentUser == null) {
      return const Scaffold(
        body: Center(
          child: CircularProgressIndicator(),
        ),
      );
    }
    final chatProvider =
context.watch<ChatProvider>();
    final chat = chatProvider.currentChat;
    return Scaffold(
      appBar: buildAppBar(chat, context),
      body: SafeArea(
        child: Padding(
          padding: const
EdgeInsets.symmetric(horizontal: 16, vertical: 8),
          child: Column(
            children: [
              Expanded(
                child: chat == null
                    ? const Center(
                        child:
CircularProgressIndicator(),
                      )
                    : ChatDisplay(chat: chat),
              ),
              const ChatInput(),
            ],
          ),
        ),
      ),
    );
  }
```


2:10
New Chat
Type a message


Solution
Challenge
Google Developer Student Clubs



That’s it!

Thank you for listening!

Do you have any questions?