

# A Domain-Specific Language for Adaptive Case Management

Tri Huynh, 24.06.2021, sebis day

Chair of Software Engineering for Business Information Systems (sebis)  
Faculty of Informatics  
Technische Universität München  
[www.matthes.in.tum.de](http://www.matthes.in.tum.de)

# Motivation



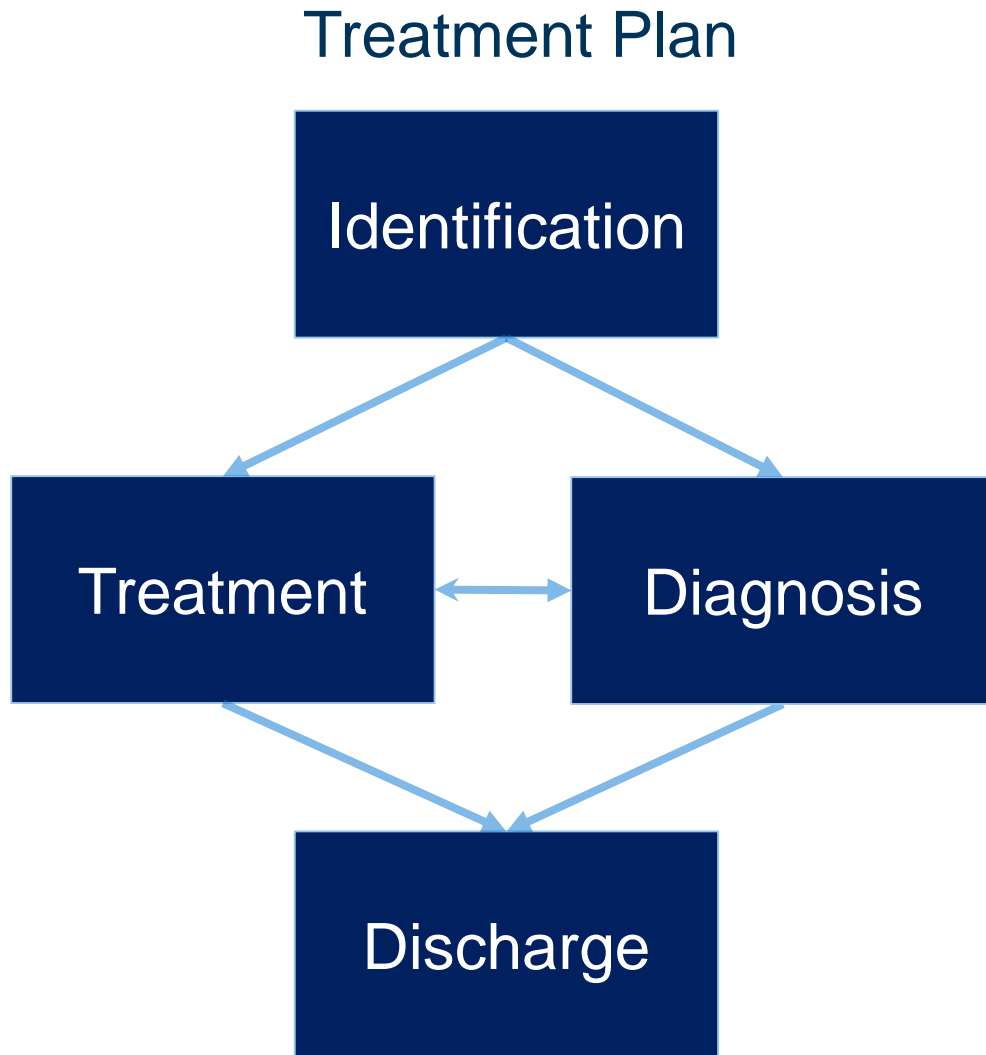
Collaborative Healthcare

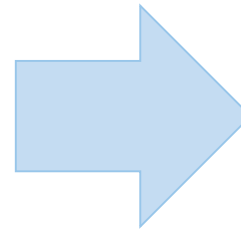
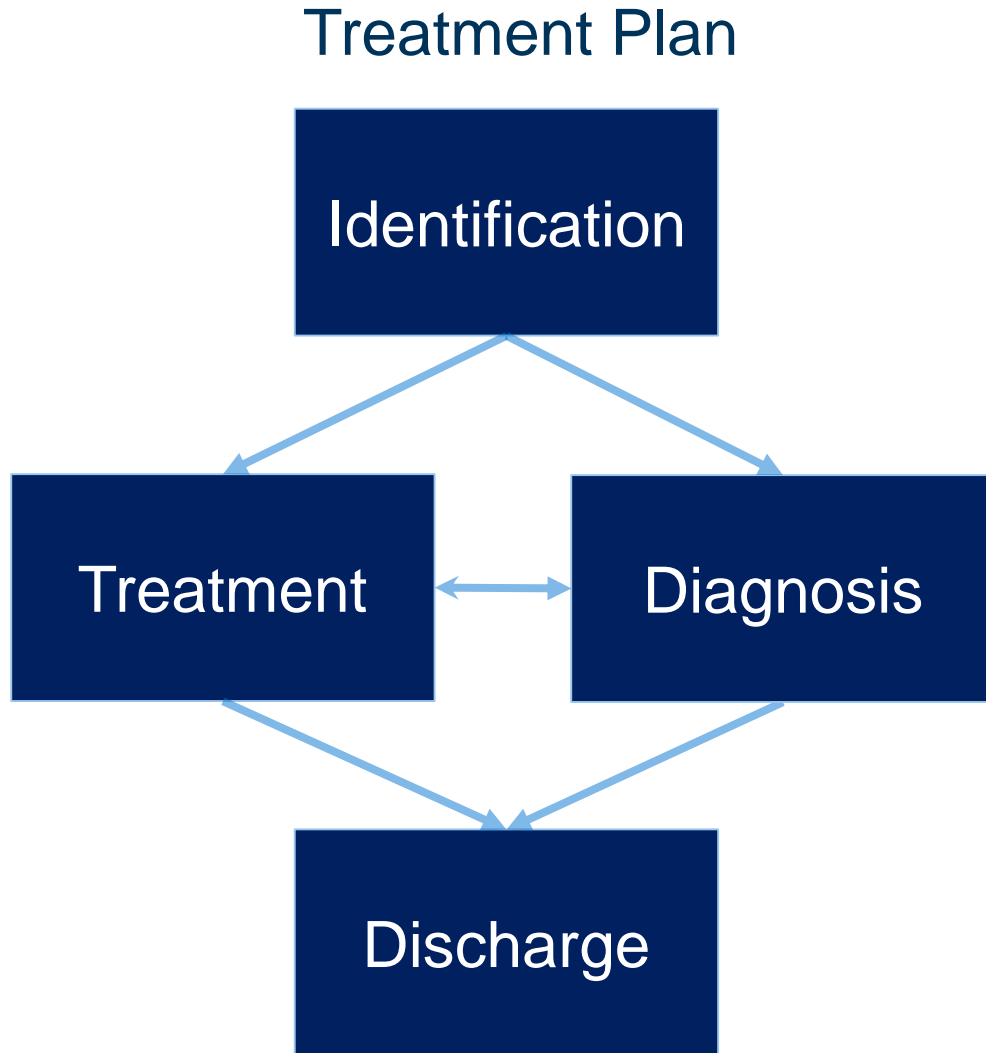
Adaptive Treatment of Chronic Diseases

Operating in Spain, Holland and Israel

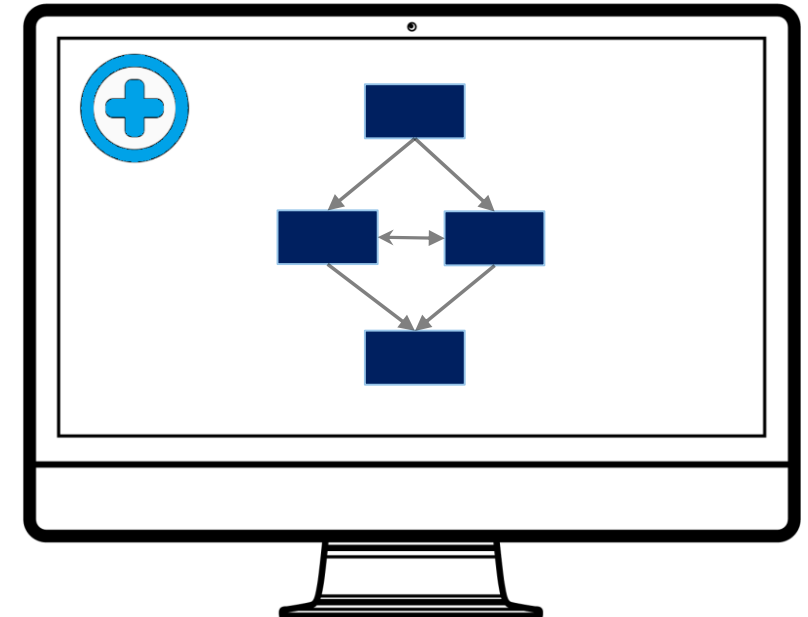


**A Modelling Language**  
**for Doctors**  
**to define Treatment Plans**  
with a hopefully user-friendly grammar

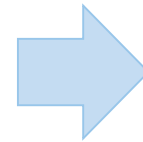
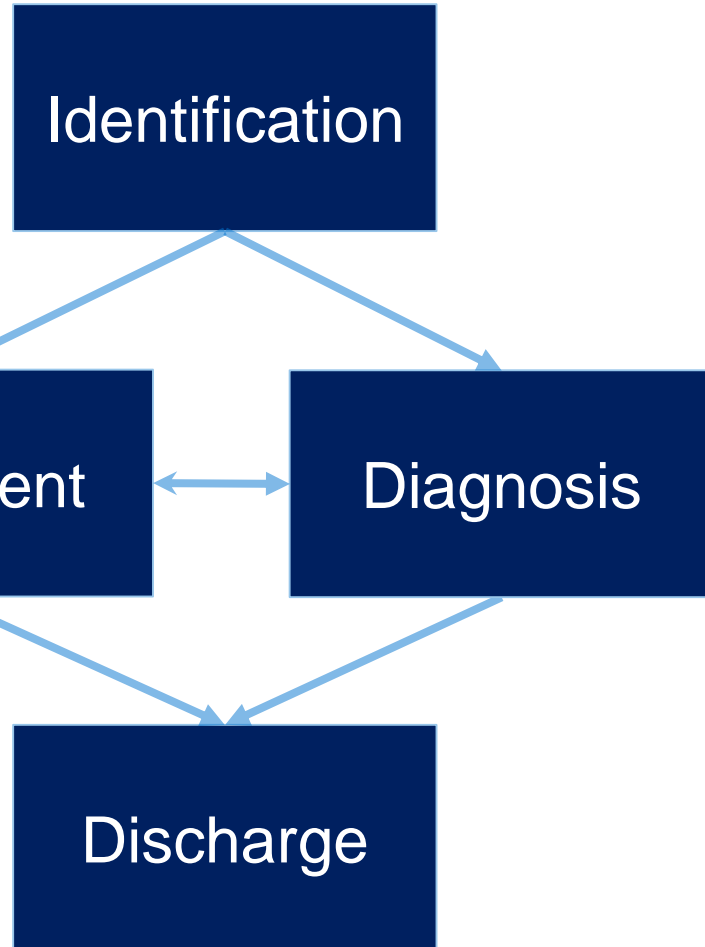




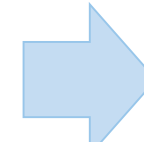
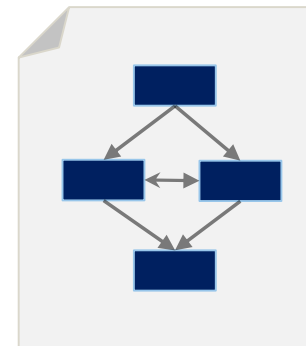
## e-Health System



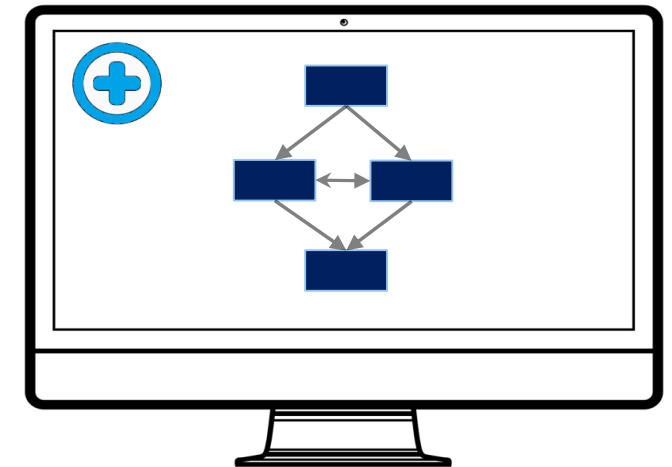
## Treatment Plan



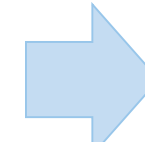
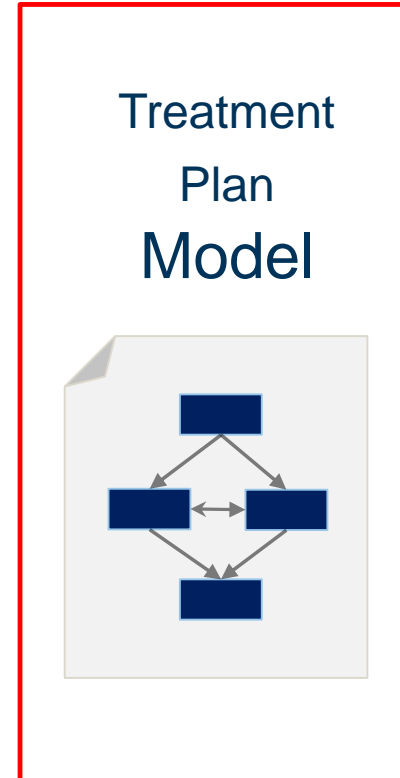
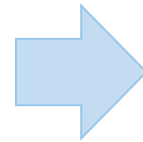
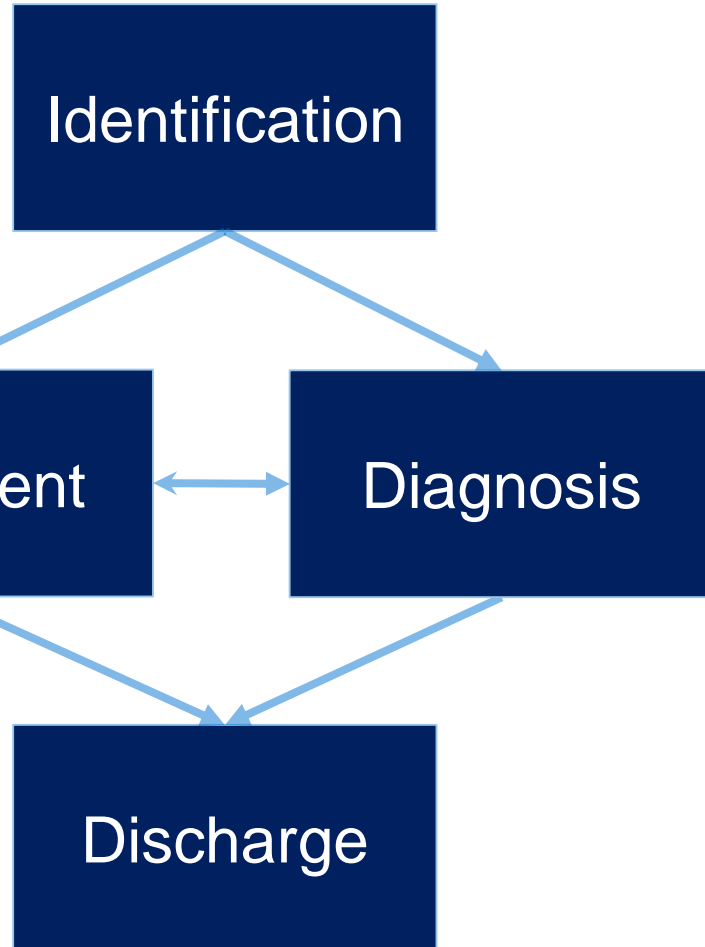
## Treatment Plan Model



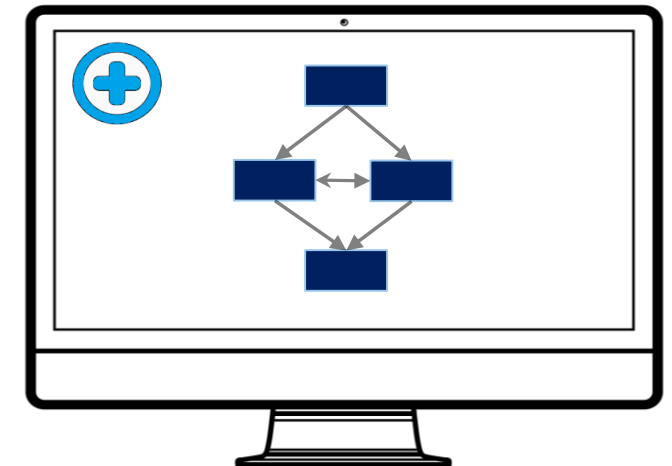
## e-Health System



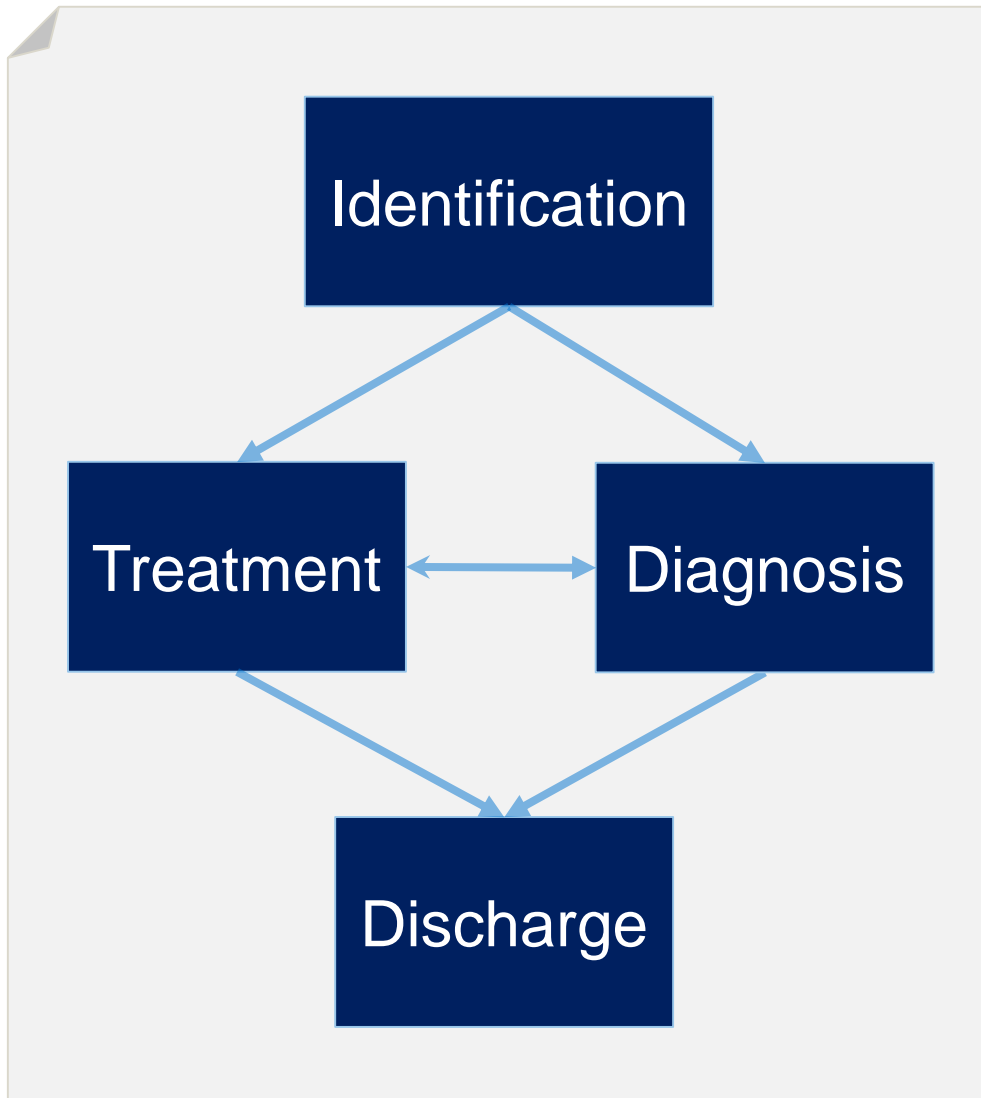
## Treatment Plan



## e-Health System



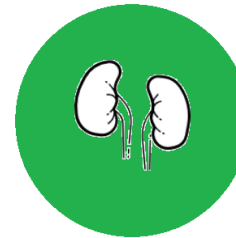




Adaptive Process Definition	
Variable elements	Preconditions

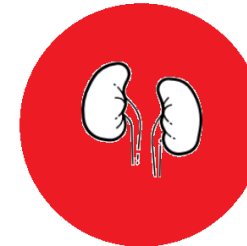
Kidney Condition

GFR > 90



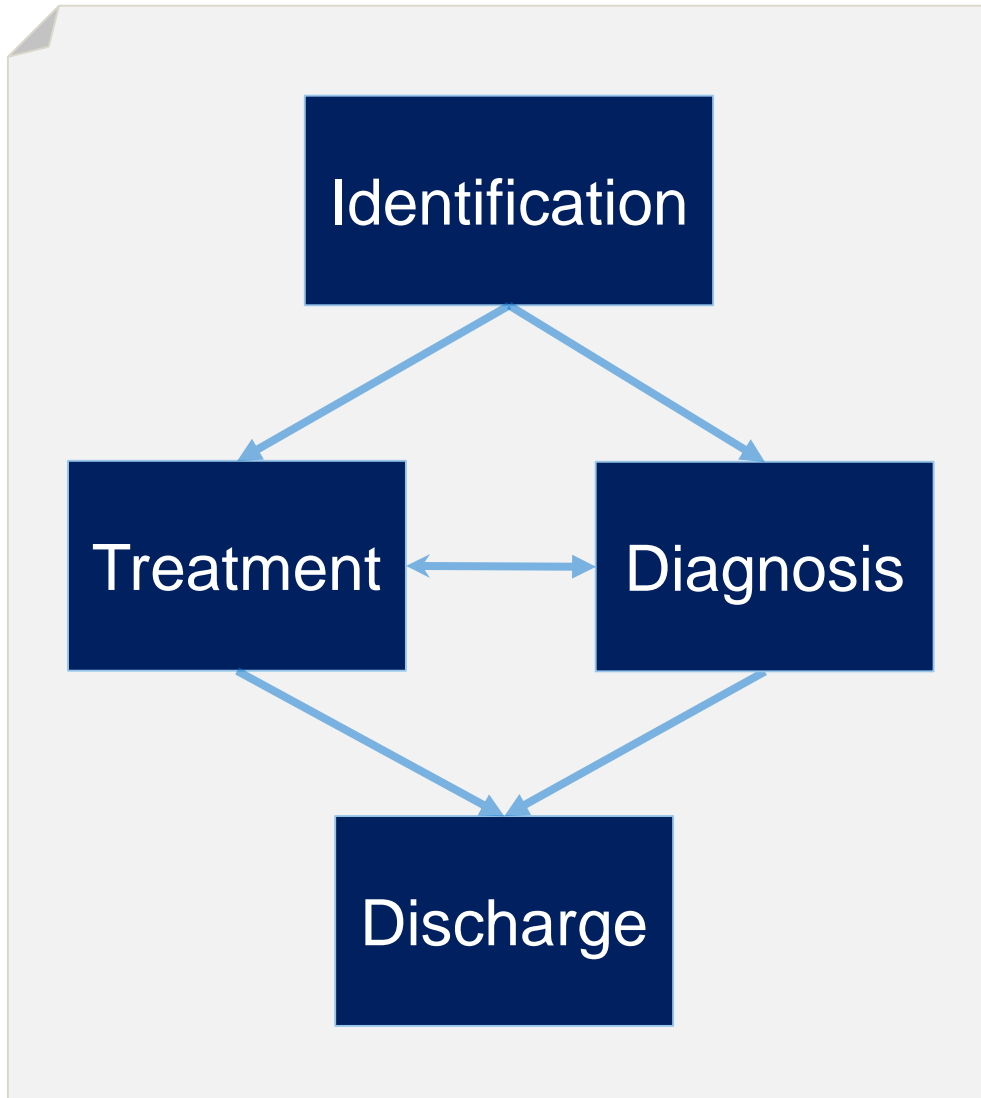
Healthy

GFR < 15

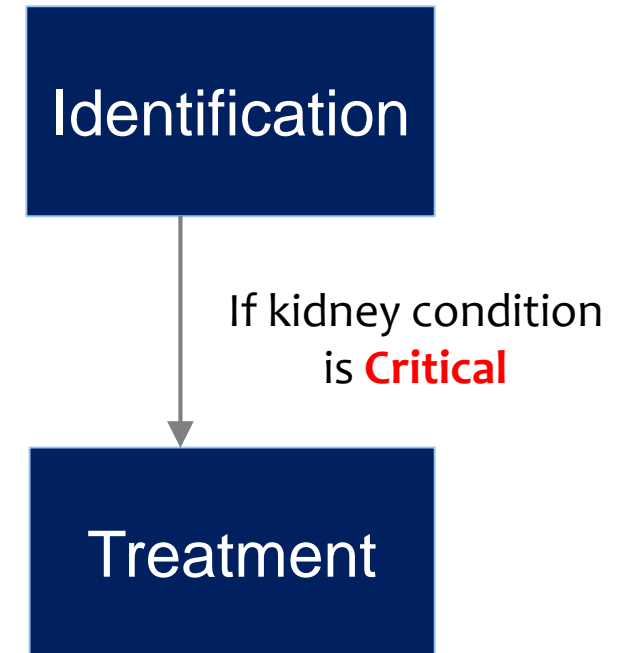
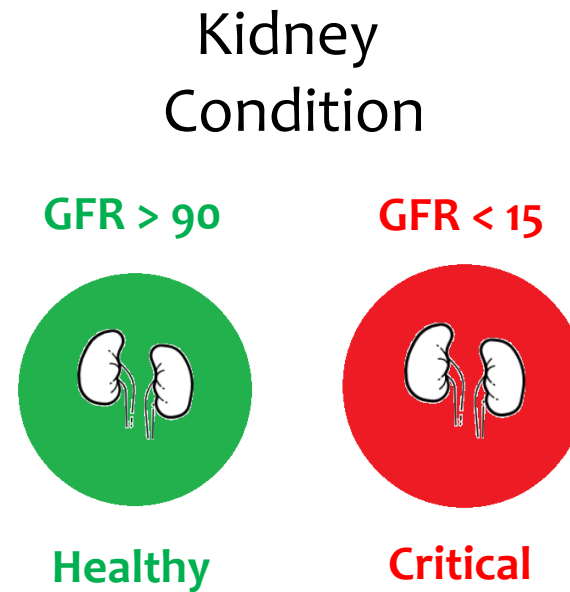


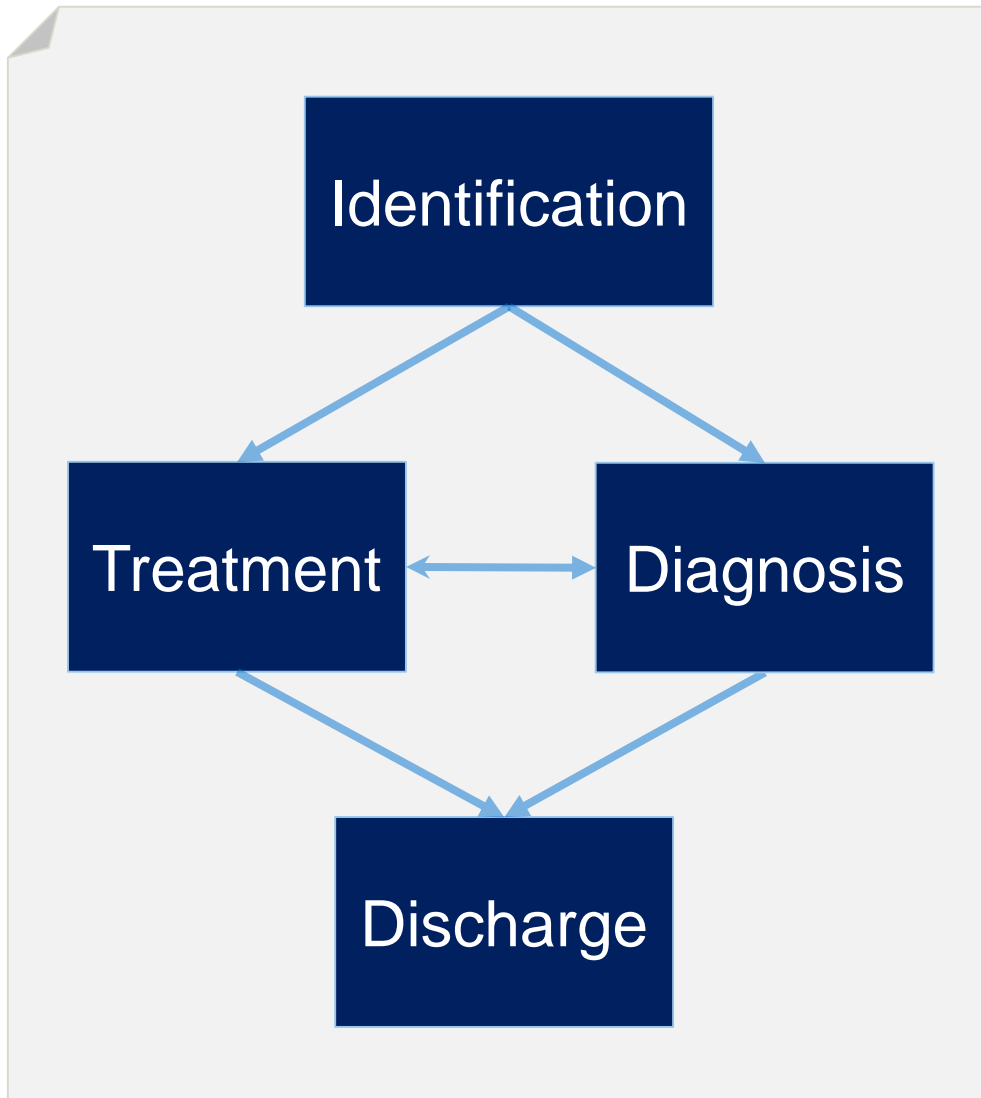
Critical





Adaptive Process Definition	
Variable elements	Preconditions

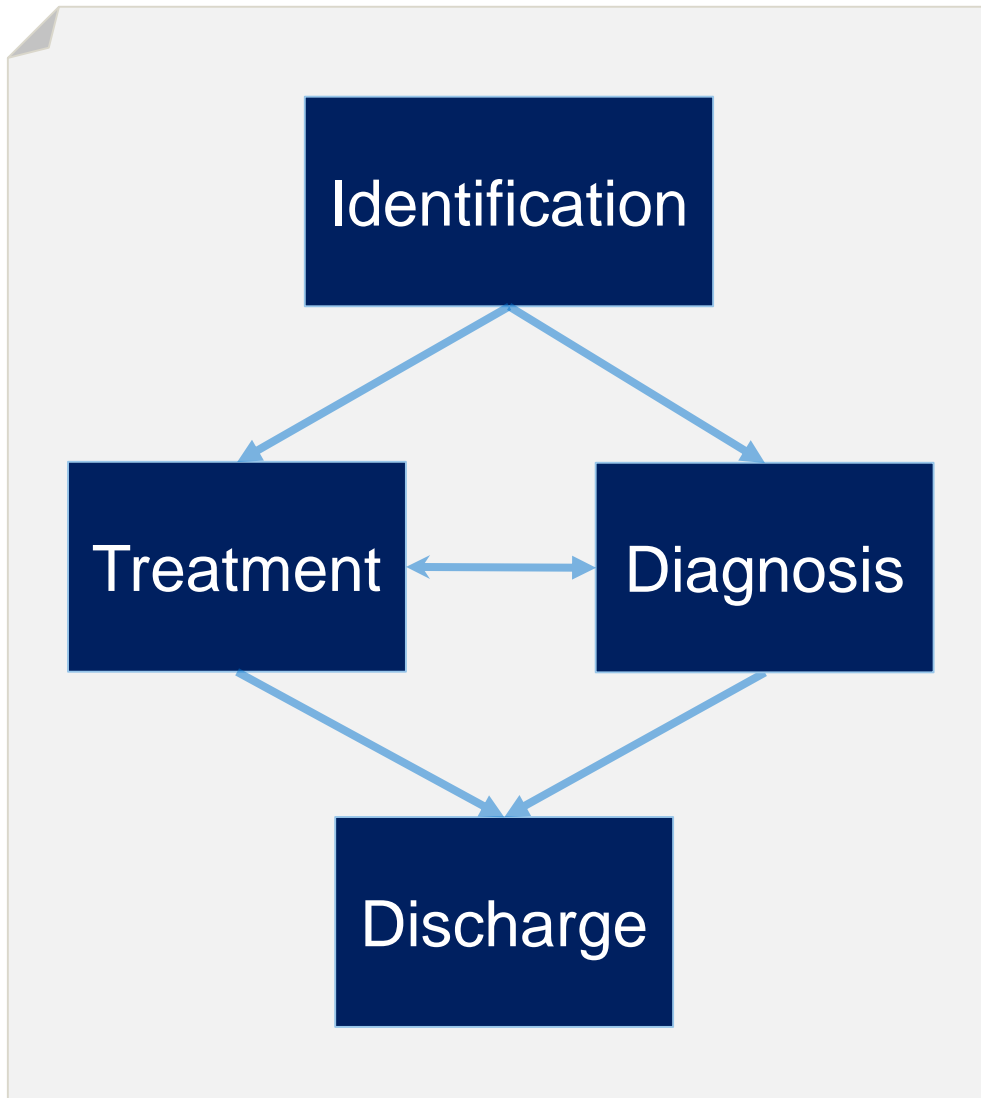




Adaptive Process Definition	
Variable elements	Preconditions

Responsible Medical Experts/Groups

# Treatment Plan Model - Components



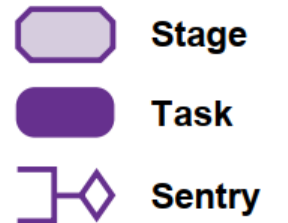
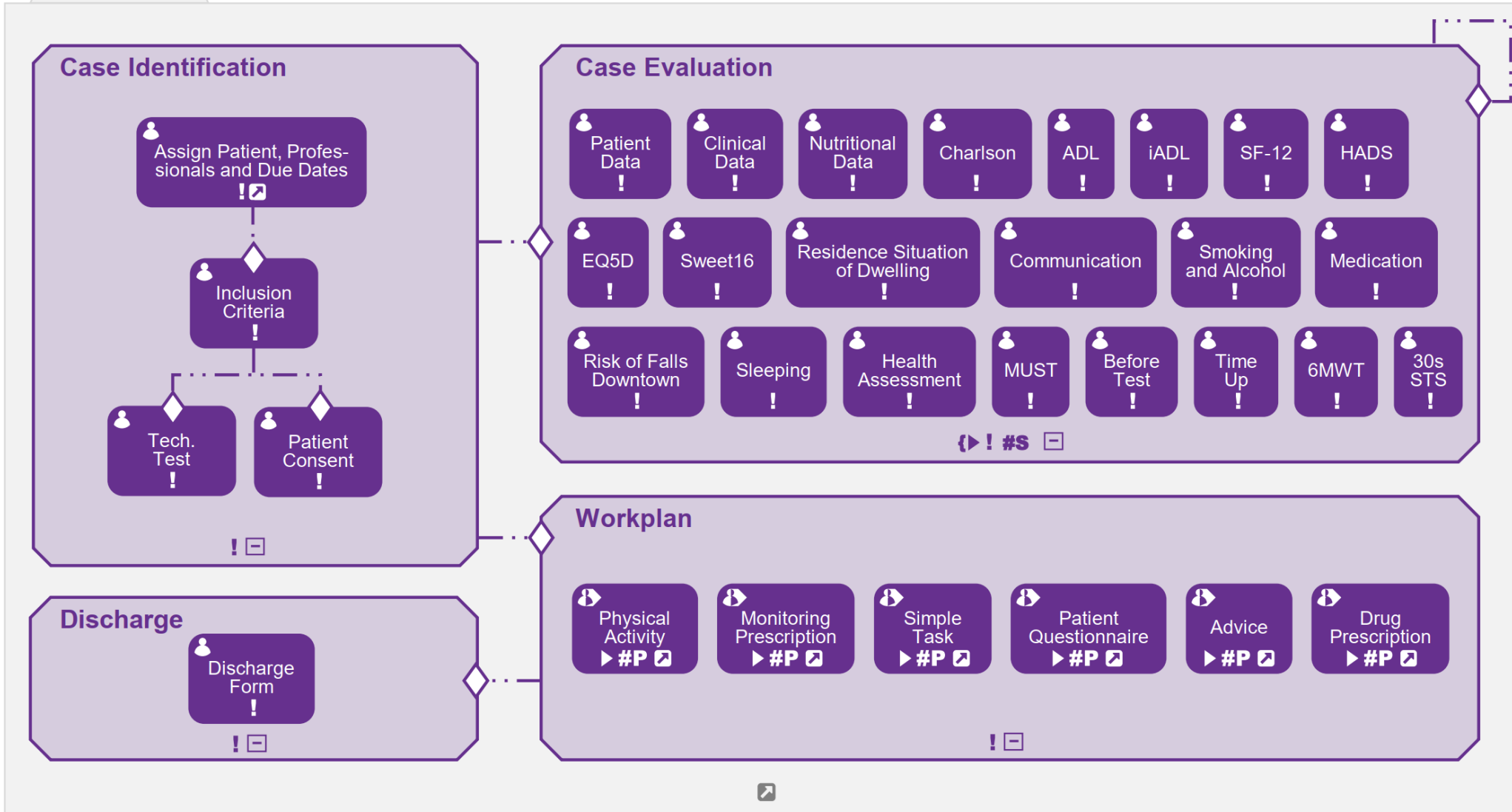
Adaptive Process Definition	
Variable elements	Preconditions

Responsible Medical Experts/Groups

External Communication

# Treatment Plan Model – A Real Example

Tel Aviv CS2



# Treatment Plan Model – Stage Definition Example

Seem  
Complex?

```
<EntityDefinition id="GCS2_Identification" description="Identification">
  <AttributeDefinition
    id="GCS2_PatientsConsent"
    type="Link.EntityDefinition.GCS2_PatientsConsent"
    multiplicity="maximalOne" description="Patient's consent"/>

  <AttributeDefinition id="GCS2_ASA"
    type="Link.EntityDefinition.GCS2_ASA"
    multiplicity="maximalOne" description="ASA"/>

  <AttributeDefinition id="GCS2_ThechTest"
    type="Link.EntityDefinition.GCS2_ThechTest"
    multiplicity="maximalOne" description="Technological Test."/>

  <AttributeDefinition id="GCS2_SiteOfSurgery"
    type="Link.EntityDefinition.GCS2_SiteOfSurgery"
    multiplicity="maximalOne" description="Site of Surgery"/>
</EntityDefinition>

<StageDefinition id="GCS2_CaseIdentification" description="Case Identification"
  isMandatory="true" repeatable="ONCE"
  entityDefinitionId="GCS2_Identification" entityAttachPath="GCS2_Identification">

  <HumanTaskDefinition id="GCS2_SelectPatient" externalId="SelectPatient" description="Assign Patient"
    ownerPath="GCS2_Settings.Clinician" isMandatory="true" repeatable="ONCE">

    <HttpHookDefinition on="COMPLETE" url="http://integration-producer/sacm/link"
      method="POST" failureMessage="Could not send patient inclusion to Self-Management System!"/>

    <TaskParamDefinition path="GCS2_Settings.Patient" isReadOnly="false" isMandatory="true"/>

    <TaskParamDefinition path="GCS2_Settings.Clinician" isReadOnly="false" isMandatory="true"/>

  </HumanTaskDefinition>
</StageDefinition>
```

# Treatment Plan Model Comprehension [1]

```
<EntityDefinition id="GCS2_Identification" description="Identification">
  <AttributeDefinition
    id="GCS2_PatientsConsent"
    type="Link.EntityDefinition.GCS2_PatientsConsent"
    multiplicity="maximalOne" description="Patient's consent"/>

  <AttributeDefinition id="GCS2_ASA"
    type="Link.EntityDefinition.GCS2_ASA"
    multiplicity="maximalOne" description="ASA"/>

  <AttributeDefinition id="GCS2_TechTest"
    type="Link.EntityDefinition.GCS2_TechTest"
    multiplicity="maximalOne" description="Technological Test."/>

  <AttributeDefinition id="GCS2_SiteOfSurgery"
    type="Link.EntityDefinition.GCS2_SiteOfSurgery"
    multiplicity="maximalOne" description="Site of Surgery"/>
</EntityDefinition>

<StageDefinition id="GCS2_CaseIdentification" description="Case Identification"
  isMandatory="true" repeatable="ONCE"
  entityDefinitionId="GCS2_Identification" entityAttachPath="GCS2_Identification">

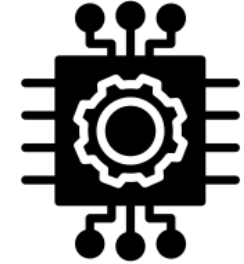
  <HumanTaskDefinition id="GCS2_SelectPatient" externalId="SelectPatient" description="Assign Patient"
    ownerPath="GCS2_Settings.Clinician" isMandatory="true" repeatable="ONCE">

    <HttpHookDefinition on="COMPLETE" url="http://integration-producer/sacm/link"
      method="POST" failureMessage="Could not send patient inclusion to Self-Management System!"/>

    <TaskParamDefinition path="GCS2_Settings.Patient" isReadOnly="false" isMandatory="true"/>

    <TaskParamDefinition path="GCS2_Settings.Clinician" isReadOnly="false" isMandatory="true"/>

  </HumanTaskDefinition>
</StageDefinition>
```



Technician

# Treatment Plan Model Comprehension [2]



Doctor

```
<EntityDefinition id="GCS2_Identification" description="Identification">
  <AttributeDefinition
    id="GCS2_PatientsConsent"
    type="Link.EntityDefinition.GCS2_PatientsConsent"
    multiplicity="maximalOne" description="Patient's consent"/>

  <AttributeDefinition id="GCS2_ASA"
    type="Link.EntityDefinition.GCS2_ASA"
    multiplicity="maximalOne" description="ASA"/>

  <AttributeDefinition id="GCS2_TechTest"
    type="Link.EntityDefinition.GCS2_TechTest"
    multiplicity="maximalOne" description="Technological Test."/>

  <AttributeDefinition id="GCS2_SiteOfSurgery"
    type="Link.EntityDefinition.GCS2_SiteOfSurgery"
    multiplicity="maximalOne" description="Site of Surgery"/>
</EntityDefinition>

<StageDefinition id="GCS2_CaseIdentification" description="Case Identification"
  isMandatory="true" repeatable="ONCE"
  entityDefinitionId="GCS2_Identification" entityAttachPath="GCS2_Identification">

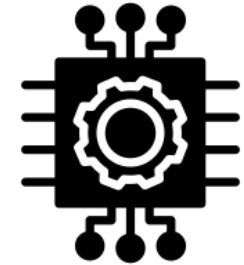
  <HumanTaskDefinition id="GCS2_SelectPatient" externalId="SelectPatient" description="Assign Patient"
    ownerPath="GCS2_Settings.Clinician" isMandatory="true" repeatable="ONCE">

    <HttpHookDefinition on="COMPLETE" url="http://integration-producer/sacm/link"
      method="POST" failureMessage="Could not send patient inclusion to Self-Management System!"/>

    <TaskParamDefinition path="GCS2_Settings.Patient" isReadOnly="false" isMandatory="true"/>

    <TaskParamDefinition path="GCS2_Settings.Clinician" isReadOnly="false" isMandatory="true"/>

  </HumanTaskDefinition>
</StageDefinition>
```

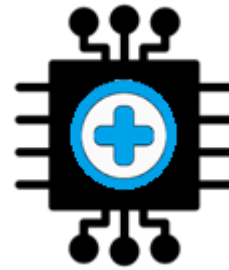


Technician



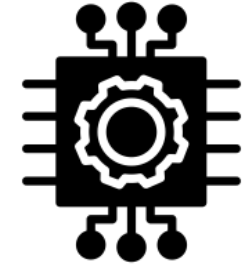


Medical Experts



# Acadela

Adaptive Case Definition Language



Technician



Doctor

**Intuitive grammar**

**Syntax & logic error detection**

**Custom IDE to enhance usability**

...



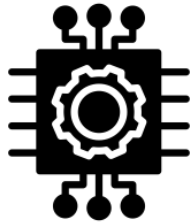
Doctor

Intuitive grammar

Syntax and logic **error detection**

**Custom IDE** to enhance usability

**Reusable components**

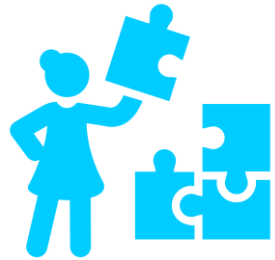


Technician

Usable & Learnable

Reduce Technical Support Effort

**Compatibility to Existing System**

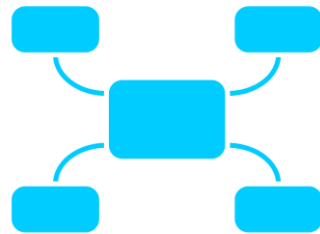


Expressive  
Engine

A Domain Specific Language  
to **model treatment plans**  
with



Reusable  
Models



Purely  
Model-Based  
Customization



Intuitive  
Syntax



Tool Support  
(Web-Based IDE)



M.Sc.

**Tri Huynh**

Technische Universität München  
Faculty of Informatics  
Chair of Software Engineering for Business  
Information Systems

Boltzmannstraße 3  
85748 Garching bei München

Tel +49.89.289.17100

Fax +49.89.289.17136

tri.huynh@in.tum.de  
[www.matthes.in.tum.de](http://www.matthes.in.tum.de)

