

Results - Design Patterns

Model: gpt-4o-mini

Document: 15page rice document

Date: 19/03/2025 (RE-TEST)

Technique: Pattern-based learning

Context 1 (crop kB)- ontology – rice part 01

Hierarchical Classes – individual and Attributes

```
"Crop": {
  "variety": [
    {
      "individual_name": "PR 131",
      "average_yield": "31.0",
      "average_yield_unit": "quintals per acre",
      "average plant height": "111",
      "average plant height units": "cm",
      "maturity period": "110",
      "maturity period units": "days"
    },
    {
      "individual_name": "PR 130",
      "average_yield": "30.0",
      "average_yield_unit": "quintals per acre",
      "average plant height": "108",
      "average plant height units": "cm",
      "maturity period": "105",
      "maturity period units": "days"
    },
    {
      "individual_name": "PR 129",
      "average_yield": "30.0",
      "average_yield_unit": "quintals per acre",
      "average plant height": "105",
      "average plant height units": "cm",
      "maturity period": "108",
      "maturity period units": "days"
    },
    {
      "individual_name": "PR 128",
      "average_yield": "30.5",
      "average_yield_unit": "quintals per acre",
      "average plant height": "110",
      "average plant height units": "cm",
      "maturity period": "111",
      "maturity period units": "days"
    },
    {
      "individual_name": "HKR 47",
```

```
"average_yield": "29.5",
"average_yield_unit": "quintals per acre",
"average plant height": "117",
"average plant height units": "cm",
"maturity period": "104",
"maturity period units": "days"
},
{
  "individual_name": "PR 127",
  "average_yield": "30.0",
  "average_yield_unit": "quintals per acre",
  "average plant height": "104",
  "average plant height units": "cm",
  "maturity period": "107",
  "maturity period units": "days"
},
{
  "individual_name": "PR 126",
  "average_yield": "30.0",
  "average_yield_unit": "quintals per acre",
  "average plant height": "102",
  "average plant height units": "cm",
  "maturity period": "93",
  "maturity period units": "days"
},
{
  "individual_name": "PR 122",
  "average_yield": "31.5",
  "average_yield_unit": "quintals per acre",
  "average plant height": "108",
  "average plant height units": "cm",
  "maturity period": "117",
  "maturity period units": "days"
},
{
  "individual_name": "PR 121",
  "average_yield": "30.5",
  "average_yield_unit": "quintals per acre",
  "average plant height": "98",
  "average plant height units": "cm",
  "maturity period": "110",
  "maturity period units": "days"
},
{
  "individual_name": "PR 114",
  "average_yield": "27.5",
  "average_yield_unit": "quintals per acre",
  "average plant height": "102",
  "average plant height units": "cm",
  "maturity period": "115",
  "maturity period units": "days"
}
```

```

    },
    {
      "individual_name": "PR 113",
      "average_yield": "28.0",
      "average_yield_unit": "quintals per acre",
      "average plant height": "105",
      "average plant height units": "cm",
      "maturity period": "112",
      "maturity period units": "days"
    },
  ]
]
}
}

```

Binary

Binary pattern

```

"ObjectPropertyAxiom": [
  {
    "INDIVIDUAL": ["Rice", "PR 126"],
    "OBJECT_PROPERTY": "hasVariety",
    "DOMAIN": "Crop",
    "RANGE": "Variety",
    "AXIOM": "Rice hasVariety PR 126"
  },
  {
    "INDIVIDUAL": ["Rice", "PR 127"],
    "OBJECT_PROPERTY": "hasVariety",
    "DOMAIN": "Crop",
    "RANGE": "Variety",
    "AXIOM": "Rice hasVariety PR 127"
  },
  {
    "INDIVIDUAL": ["Rice", "PR 130"],
    "OBJECT_PROPERTY": "hasVariety",
    "DOMAIN": "Crop",
    "RANGE": "Variety",
    "AXIOM": "Rice hasVariety PR 130"
  },
  {
    "INDIVIDUAL": ["Rice", "PR 131"],
    "OBJECT_PROPERTY": "hasVariety",
    "DOMAIN": "Crop",
    "RANGE": "Variety",
    "AXIOM": "Rice hasVariety PR 131"
  },
  {
    "INDIVIDUAL": ["Rice", "PR 128"],
    "OBJECT_PROPERTY": "hasVariety",

```

```

"DOMAIN": "Crop",
"RANGE": "Variety",
"AXIOM": "Rice hasVariety PR 128"
},
{
  "INDIVIDUAL": ["Rice", "PR 129"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety PR 129"
},
{
  "INDIVIDUAL": ["Rice", "HKR 47"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety HKR 47"
},
{
  "INDIVIDUAL": ["Rice", "PR 114"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety PR 114"
},
{
  "INDIVIDUAL": ["Rice", "PR 121"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety PR 121"
},
{
  "INDIVIDUAL": ["Rice", "PR 122"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety PR 122"
},
{
  "INDIVIDUAL": ["Rice", "PR 113"],
  "OBJECT_PROPERTY": "hasVariety",
  "DOMAIN": "Crop",
  "RANGE": "Variety",
  "AXIOM": "Rice hasVariety PR 113"
}
]
}

```

```

"ObjectPropertyAxiom": [
{

```

```

"INDIVIDUAL": ["Rice", "loamy soils"],
"OBJECT_PROPERTY": "hasSoilType",
"DOMAIN": "Crop",
"RANGE": "SoilType",
"AXIOM": "Rice hasSoilType loamy soils"
},

```

Context 2 (Growing Problems) – ontology- rice part 02

```

{
  "ObjectPropertyAxiom": [
    {
      "INDIVIDUAL": ["Rice", "Rice stem borers"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",
      "AXIOM": "Rice IsaffectedBy Rice stem borers"
    },
    {
      "INDIVIDUAL": ["Rice", "Leaf folder"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",
      "AXIOM": "Rice IsaffectedBy Leaf folder"
    },
    {
      "INDIVIDUAL": ["Rice", "Planthoppers"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",
      "AXIOM": "Rice IsaffectedBy Planthoppers"
    },
    {
      "INDIVIDUAL": ["Rice", "Grasshoppers"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",
      "AXIOM": "Rice IsaffectedBy Grasshoppers"
    },
    {
      "INDIVIDUAL": ["Rice", "Rice hispa"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",
      "AXIOM": "Rice IsaffectedBy Rice hispa"
    },
    {
      "INDIVIDUAL": ["Rice", "Rice root weevil"],
      "OBJECT_PROPERTY": "IsaffectedBy",
      "DOMAIN": "Crop",
      "RANGE": "GrowingProblem",

```

```

"AXIOM": "Rice IsaffectedBy Rice root weevil"
},
{
  "INDIVIDUAL": ["Rice", "Rice-ear-cutting-caterpillar"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Rice-ear-cutting-caterpillar"
},
{
  "INDIVIDUAL": ["Rice", "Sheath blight"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Sheath blight"
},
{
  "INDIVIDUAL": ["Rice", "False smut"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy False smut"
},
{
  "INDIVIDUAL": ["Rice", "Brown leaf spot"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Brown leaf spot"
},
{
  "INDIVIDUAL": ["Rice", "Blast"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Blast"
},
{
  "INDIVIDUAL": ["Rice", "Bunt/Kernel Smut"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Bunt/Kernel Smut"
},
{
  "INDIVIDUAL": ["Rice", "Sheath rot"],
  "OBJECT_PROPERTY": "IsaffectedBy",
  "DOMAIN": "Crop",
  "RANGE": "GrowingProblem",
  "AXIOM": "Rice IsaffectedBy Sheath rot"
},

```

<pre> { "INDIVIDUAL": ["Rice", "Stem rot"], "OBJECT_PROPERTY": "IsaffectedBy", "DOMAIN": "Crop", "RANGE": "GrowingProblem", "AXIOM": "Rice IsaffectedBy Stem rot" }] } </pre>
Binary
<pre> Nary "NaryPropertyAxiom": { "pattern01": { "Axioms": ["<Rice> hasGrowingProblemEvent <GPE1>", "<GPE1> hasGrowingProblem <StemBorers>", "<GPE1> hasSymptom <DeadHearts>", "<GPE1> hasCausalAgent <RiceStemBorer>", "<GPE1> hasAvailablePeriod <JulyToOctober>", "<GPE1> hasControlMethod <SprayCoragen>", "<GPE1> hasPreventionMethod <UseNeem>"], "Individuals": ["Rice","GPE1","StemBorers", "DeadHearts","RiceStemBorer","JulyToOctober","SprayCoragen","UseNeem"] }, "pattern02": { "Axioms": ["<Rice> hasGrowingProblemEvent <GPE2>", "<GPE2> hasGrowingProblem <LeafFolder>", "<GPE2> hasSymptom <WhiteStreaks>", "<GPE2> hasCausalAgent <LeafFolder>", "<GPE2> hasAvailablePeriod <AugustToOctober>", "<GPE2> hasControlMethod <MechanicalControl>", "<GPE2> hasPreventionMethod <UseNeem>"], "Individuals": ["Rice","GPE2","LeafFolder", "WhiteStreaks","LeafFolder","AugustToOctober","MechanicalControl","UseNeem"] }, "pattern03": { "Axioms": ["<Rice> hasGrowingProblemEvent <GPE3>", "<GPE3> hasGrowingProblem <Planthoppers>", "<GPE3> hasSymptom <DryPatches>"] } } </pre>

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    "<GPE3> hasCausalAgent <WhiteBackedPlanthopper>",
    "<GPE3> hasAvailablePeriod <JulyToOctober>",
    "<GPE3> hasControlMethod <SprayPexalon>",
    "<GPE3> hasPreventionMethod <UseNeem>"
  ],
  "Individuals": [
    "Rice","GPE3","Planthoppers",
    "DryPatches","WhiteBackedPlanthopper","JulyToOctober","SprayPexalon","UseNeem"
  ]
},
"pattern04": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE4>",
    "<GPE4> hasGrowingProblem <Grasshoppers>",
    "<GPE4> hasSymptom <LeafDamage>",
    "<GPE4> hasCausalAgent <Grasshopper>",
    "<GPE4> hasAvailablePeriod <Nursery>",
    "<GPE4> hasControlMethod <SprayPlanthopperInsecticides>",
    "<GPE4> hasPreventionMethod <MonitorCrop>"
  ],
  "Individuals": [
    "Rice","GPE4","Grasshoppers",
    "LeafDamage","Grasshopper","Nursery","SprayPlanthopperInsecticides","MonitorCrop"
  ]
},
"pattern05": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE5>",
    "<GPE5> hasGrowingProblem <RiceHispa>",
    "<GPE5> hasSymptom <WhiteStreaks>",
    "<GPE5> hasCausalAgent <RiceHispa>",
    "<GPE5> hasAvailablePeriod <Nursery>",
    "<GPE5> hasControlMethod <SprayEkalux>",
    "<GPE5> hasPreventionMethod <ClipLeafTips>"
  ],
  "Individuals": [
    "Rice","GPE5","RiceHispa",
    "WhiteStreaks","RiceHispa","Nursery","SprayEkalux","ClipLeafTips"
  ]
},
"pattern06": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE6>",
    "<GPE6> hasGrowingProblem <RiceRootWeevil>",
    "<GPE6> hasSymptom <YellowingStunted>",
    "<GPE6> hasCausalAgent <RiceRootWeevil>",
    "<GPE6> hasAvailablePeriod <JulyToSeptember>",
    "<GPE6> hasControlMethod <DestroyRoots>",
    "<GPE6> hasPreventionMethod <UseDiseaseFree>"
  ],
  "Individuals": [

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```

    "Rice","GPE6","RiceRootWeevil",
    "YellowingStunted","RiceRootWeevil","JulyToSeptember","DestroyRoots","UseDiseaseFree"
  ]
},
"pattern07": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE7>",
    "<GPE7> hasGrowingProblem <RiceEarCuttingCaterpillar>",
    "<GPE7> hasSymptom <LeafFeeding>",
    "<GPE7> hasCausalAgent <RiceEarCuttingCaterpillar>",
    "<GPE7> hasAvailablePeriod <SeptemberToNovember>",
    "<GPE7> hasControlMethod <Spray>",
    "<GPE7> hasPreventionMethod <MonitorDamage>"
  ],
  "Individuals": [
    "Rice","GPE7","RiceEarCuttingCaterpillar",
    "LeafFeeding","RiceEarCuttingCaterpillar","SeptemberToNovember","Spray","MonitorDamage"
  ]
},
"pattern08": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE8>",
    "<GPE8> hasGrowingProblem <SheathBlight>",
    "<GPE8> hasSymptom <GreyishGreenLesions>",
    "<GPE8> hasCausalAgent <RhizoctoniaSolani>",
    "<GPE8> hasAvailablePeriod <BootStage>",
    "<GPE8> hasControlMethod <SprayFungicides>",
    "<GPE8> hasPreventionMethod <CleanBunds>"
  ],
  "Individuals": [
    "Rice","GPE8","SheathBlight",
    "GreyishGreenLesions","RhizoctoniaSolani","BootStage","SprayFungicides","CleanBunds"
  ]
},
"pattern09": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE9>",
    "<GPE9> hasGrowingProblem <FalseSmut>",
    "<GPE9> hasSymptom <YellowGreenSporBalls>",
    "<GPE9> hasCausalAgent <UstilaginoideaVirens>",
    "<GPE9> hasAvailablePeriod <Flowering>",
    "<GPE9> hasControlMethod <SprayFungicides>",
    "<GPE9> hasPreventionMethod <OrganicManures>"
  ],
  "Individuals": [
    "Rice","GPE9","FalseSmut",
    "YellowGreenSporBalls","UstilaginoideaVirens","Flowering","SprayFungicides","OrganicManure
s"
  ]
},
"pattern10": {

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```

"Axioms": [
  "<Rice> hasGrowingProblemEvent <GPE10>",
  "<GPE10> hasGrowingProblem <BrownLeafSpot>",
  "<GPE10> hasSymptom <EyeShapedSpots>",
  "<GPE10> hasCausalAgent <DrechsleraOryzae>",
  "<GPE10> hasAvailablePeriod <BootStage>",
  "<GPE10> hasControlMethod <SprayFungicides>",
  "<GPE10> hasPreventionMethod <AdequateNutrition>"
],
"Individuals": [
  "Rice","GPE10","BrownLeafSpot",
  "EyeShapedSpots","DrechsleraOryzae","BootStage","SprayFungicides","AdequateNutrition"
]
},
"pattern11": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE11>",
    "<GPE11> hasGrowingProblem <Blast>",
    "<GPE11> hasSymptom <SpindleShapedSpots>",
    "<GPE11> hasCausalAgent <PyriculariaGrisea>",
    "<GPE11> hasAvailablePeriod <MaxTillering>",
    "<GPE11> hasControlMethod <SprayAmistar>",
    "<GPE11> hasPreventionMethod <AvoidNitrogen>"
  ],
  "Individuals": [
    "Rice","GPE11","Blast",
    "SpindleShapedSpots","PyriculariaGrisea","MaxTillering","SprayAmistar","AvoidNitrogen"
  ]
},
"pattern12": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE12>",
    "<GPE12> hasGrowingProblem <BuntKernelSmut>",
    "<GPE12> hasSymptom <BlackPowderGrains>",
    "<GPE12> hasCausalAgent <NeovossiaHorrida>",
    "<GPE12> hasAvailablePeriod <Blooming>",
    "<GPE12> hasControlMethod <SprayWater>",
    "<GPE12> hasPreventionMethod <AvoidHeavyNitrogen>"
  ],
  "Individuals": [
    "Rice","GPE12","BuntKernelSmut",
    "BlackPowderGrains","NeovossiaHorrida","Blooming","SprayWater","AvoidHeavyNitrogen"
  ]
},
"pattern13": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE13>",
    "<GPE13> hasGrowingProblem <SheathRot>",
    "<GPE13> hasSymptom <BrownLesions>",
    "<GPE13> hasCausalAgent <FusariumMoniliforme>",
    "<GPE13> hasAvailablePeriod <PreHarvest>",

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```

    "<GPE13> hasControlMethod <SprayHexaconazole>",
    "<GPE13> hasPreventionMethod <DestroyStraw>"
  ],
  "Individuals": [
    "Rice","GPE13","SheathRot",
    "BrownLesions","FusariumMoniliforme","PreHarvest","SprayHexaconazole","DestroyStraw"
  ]
},
"pattern14": {
  "Axioms": [
    "<Rice> hasGrowingProblemEvent <GPE14>",
    "<GPE14> hasGrowingProblem <StemRot>",
    "<GPE14> hasSymptom <BlackLesions>",
    "<GPE14> hasCausalAgent <SclerotiumOryzae>",
    "<GPE14> hasAvailablePeriod <Earing>",
    "<GPE14> hasControlMethod <DestroyDebris>",
    "<GPE14> hasPreventionMethod <AvoidExcessiveIrrigation>"
  ],
  "Individuals": [
    "Rice","GPE14","StemRot",
    "BlackLesions","SclerotiumOryzae","Earing","DestroyDebris","AvoidExcessiveIrrigation"
  ]
}
}
}

```

Attribute-pattern