

# Car SUV Classification Query



```
cars = {
  'Tesla Model S': {
    'sedan': True,
    'suv': False,
    'truck': False,
    'coupe': False,
    'convertible': False,
    'electric': True,
    'hybrid': False,
    'gas': False,
    'luxury': True,
    'sports': False,
    'off_road': False,
    'all_wheel_drive': True,
    'front_wheel_drive': False,
    'rear_wheel_drive': False,
    'domestic': True,
    'seats_2': False,
    'seats_4': False,
    'seats_5': True,
    'seats_7plus': False,
    'expensive': True
  },
  'Toyota Corolla': {
    'sedan': True,
    'suv': False,
    'truck': False,
    'coupe': False,
    'convertible': False,
    'electric': False,
    'hybrid': False,
    'gas': True,
    'luxury': False,
    'sports': False,
    'off_road': False,
    'all_wheel_drive': False,
    'front_wheel_drive': True,
    'rear_wheel_drive': False,
    'domestic': False,
    'seats_2': False,
    'seats_4': False,
    'seats_5': True,
    'seats_7plus': False,
    'expensive': False
  }
}
```

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},
'Ford F-150': {
  'sedan': False,
  'suv': False,
  'truck': True,
  'coupe': False,
  'convertible': False,
  'electric': False,
  'hybrid': True,
  'gas': False,
  'luxury': False,
  'sports': False,
  'off_road': True,
  'all_wheel_drive': True,
  'front_wheel_drive': False,
  'rear_wheel_drive': False,
  'domestic': True,
  'seats_2': False,
  'seats_4': False,
  'seats_5': True,
  'seats_7plus': False,
  'expensive': False
},
'BMW 3 Series': {
  'sedan': True,
  'suv': False,
  'truck': False,
  'coupe': False,
  'convertible': False,
  'electric': False,
  'hybrid': False,
  'gas': True,
  'luxury': True,
  'sports': False,
  'off_road': False,
  'all_wheel_drive': False,
  'front_wheel_drive': False,
  'rear_wheel_drive': True,
  'domestic': False,
  'seats_2': False,
  'seats_4': False,
  'seats_5': True,
  'seats_7plus': False,
  'expensive': False
},
'Jeep Wrangler': {
  'sedan': False,
  'suv': True,
  'truck': False,
  'coupe': False,
  'convertible': True,

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    'electric': False,
    'hybrid': False,
    'gas': True,
    'luxury': False,
    'sports': False,
    'off_road': True,
    'all_wheel_drive': True,
    'front_wheel_drive': False,
    'rear_wheel_drive': False,
    'domestic': True,
    'seats_2': False,
    'seats_4': False,
    'seats_5': True,
    'seats_7plus': False,
    'expensive': False
},
'Honda Civic': {
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    'suv': False,
    'truck': False,
    'coupe': False,
    'convertible': False,
    'electric': False,
    'hybrid': False,
    'gas': True,
    'luxury': False,
    'sports': True,
    'off_road': False,
    'all_wheel_drive': False,
    'front_wheel_drive': True,
    'rear_wheel_drive': False,
    'domestic': False,
    'seats_2': False,
    'seats_4': False,
    'seats_5': True,
    'seats_7plus': False,
    'expensive': False
},
'Chevrolet Bolt': {
    'sedan': True,
    'suv': False,
    'truck': False,
    'coupe': False,
    'convertible': False,
    'electric': True,
    'hybrid': False,
    'gas': False,
    'luxury': False,
    'sports': False,
    'off_road': False,
    'all_wheel_drive': False,

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'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Subaru Outback': {
'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': False,
'off_road': True,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Mercedes-Benz S-Class': {
'sedan': True,
'suv': False,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,

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    'expensive': True
  },
  'Porsche 911': {
    'sedan': False,
    'suv': False,
    'truck': False,
    'coupe': True,
    'convertible': False,
    'electric': False,
    'hybrid': False,
    'gas': True,
    'luxury': True,
    'sports': True,
    'off_road': False,
    'all_wheel_drive': True,
    'front_wheel_drive': False,
    'rear_wheel_drive': True,
    'domestic': False,
    'seats_2': True,
    'seats_4': False,
    'seats_5': False,
    'seats_7plus': False,
    'expensive': True
  },
  'Ferrari 488': {
    'sedan': False,
    'suv': False,
    'truck': False,
    'coupe': True,
    'convertible': True,
    'electric': False,
    'hybrid': False,
    'gas': True,
    'luxury': True,
    'sports': True,
    'off_road': False,
    'all_wheel_drive': False,
    'front_wheel_drive': False,
    'rear_wheel_drive': True,
    'domestic': False,
    'seats_2': True,
    'seats_4': False,
    'seats_5': False,
    'seats_7plus': False,
    'expensive': True
  },
  'Toyota Prius': {
    'sedan': True,
    'suv': False,
    'truck': False,
    'coupe': False,

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'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': False,
'sports': False,
'off_road': False,
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'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Ford Mustang': {
'sedan': False,
'suv': False,
'truck': False,
'coupe': True,
'convertible': True,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': True,
'seats_2': False,
'seats_4': True,
'seats_5': False,
'seats_7plus': False,
'expensive': False
},
'Chevrolet Tahoe': {
'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': False,
'off_road': True,

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'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
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'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'Mini Cooper': {
'sedan': False,
'suv': False,
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'coupe': True,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
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'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': True,
'seats_5': False,
'seats_7plus': False,
'expensive': False
},
'Volkswagen Golf': {
'sedan': False,
'suv': False,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,

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'seats_7plus': False,
'expensive': False
},
'Audi A4': {
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'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': False,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
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},
'Audi R8': {
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'suv': False,
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'coupe': True,
'convertible': True,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': True,
'seats_4': False,
'seats_5': False,
'seats_7plus': False,
'expensive': True
},
'Lamborghini Huracan': {
'sedan': False,
'suv': False,
'truck': False,

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'coupe': True,
'convertible': True,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': False,
'seats_2': True,
'seats_4': False,
'seats_5': False,
'seats_7plus': False,
'expensive': True
},
'Toyota Camry': {
'sedan': True,
'suv': False,
'truck': False,
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'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Nissan Altima': {
'sedan': True,
'suv': False,
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'coupe': False,
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'gas': True,
'luxury': False,
'sports': False,

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'off_road': False,
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'rear_wheel_drive': False,
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'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Nissan Leaf': {
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'suv': False,
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'coupe': False,
'convertible': False,
'electric': True,
'hybrid': False,
'gas': False,
'luxury': False,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Hyundai Sonata': {
'sedan': True,
'suv': False,
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'convertible': False,
'electric': False,
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'gas': False,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,

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'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Kia Soul': {
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'truck': False,
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'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Kia Telluride': {
'sedan': False,
'suv': True,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': True,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'BMW X5': {
'sedan': False,
'suv': True,

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'truck': False,
'coupe': False,
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'electric': False,
'hybrid': True,
'gas': False,
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'sports': False,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'BMW i3': {
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'convertible': False,
'electric': True,
'hybrid': False,
'gas': False,
'luxury': True,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': True,
'seats_5': False,
'seats_7plus': False,
'expensive': False
},
'Lexus RX': {
'sedan': False,
'suv': True,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,

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'sports': False,
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'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
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'seats_4': False,
'seats_5': True,
'seats_7plus': True,
'expensive': False
},
'Lexus LC 500': {
'sedan': False,
'suv': False,
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'coupe': True,
'convertible': True,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': False,
'seats_2': False,
'seats_4': True,
'seats_5': False,
'seats_7plus': False,
'expensive': True
},
'Volvo XC90': {
'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,
'sports': False,
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'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,

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'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'Acura MDX': {
'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'Acura NSX': {
'sedan': False,
'suv': False,
'truck': False,
'coupe': True,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': True,
'seats_4': False,
'seats_5': False,
'seats_7plus': False,
'expensive': True
},
'Volkswagen Tiguan': {
'sedan': False,

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'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
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'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'Mazda CX-5': {
'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Mazda MX-5 Miata': {
'sedan': False,
'suv': False,
'truck': False,
'coupe': False,
'convertible': True,
'electric': False,
'hybrid': False,
'gas': True,

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'luxury': False,
'sports': True,
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'all_wheel_drive': False,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': False,
'seats_2': True,
'seats_4': False,
'seats_5': False,
'seats_7plus': False,
'expensive': False
},
'Dodge Charger': {
'sedan': True,
'suv': False,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Dodge Challenger': {
'sedan': False,
'suv': False,
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'coupe': True,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
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'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': True,

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```

'seats_2': False,
'seats_4': True,
'seats_5': False,
'seats_7plus': False,
'expensive': False
},
'Ram 1500': {
'sedan': False,
'suv': False,
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'electric': False,
'hybrid': False,
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'sports': False,
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'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'GMC Sierra': {
'sedan': False,
'suv': False,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': True,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Cadillac Escalade': {

```

```

'sedan': False,
'suv': True,
'truck': False,
'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
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'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': True
},
'Cadillac CTS': {
'sedan': True,
'suv': False,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': False,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': True,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': False
},
'Buick Enclave': {
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'electric': False,
'hybrid': False,

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'gas': True,
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'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': True,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
'expensive': False
},
'Bugatti Veyron': {
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'electric': False,
'hybrid': False,
'gas': True,
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'off_road': False,
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'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
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'domestic': False,
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'seats_7plus': False,
'expensive': False
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'suv': True,
'truck': False,
'coupe': False,
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'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': False,
'seats_7plus': True,
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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': True,
'sports': False,
'off_road': False,
'all_wheel_drive': False,
'front_wheel_drive': True,
'rear_wheel_drive': False,
'domestic': True,

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'coupe': False,
'convertible': False,
'electric': False,
'hybrid': True,
'gas': False,
'luxury': False,
'sports': False,
'off_road': True,
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'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': False,
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'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': False,
'sports': False,
'off_road': True,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
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'seats_5': True,
'seats_7plus': False,
'expensive': False
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'Subaru BRZ': {
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'rear_wheel_drive': True,
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'convertible': False,
'electric': False,
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'rear_wheel_drive': True,
'domestic': False,
'seats_2': True,
'seats_4': False,
'seats_5': False,
'seats_7plus': False,
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'Alfa Romeo Giulia': {
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'suv': False,
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'rear_wheel_drive': True,
'domestic': False,
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'convertible': False,
'electric': False,
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'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
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'expensive': False
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'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': True,
'off_road': False,
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'coupe': False,
'convertible': False,
'electric': True,
'hybrid': False,
'gas': False,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': True,
'front_wheel_drive': False,
'rear_wheel_drive': False,
'domestic': False,
'seats_2': False,
'seats_4': False,
'seats_5': True,
'seats_7plus': False,
'expensive': True
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'Aston Martin Valkyrie': {
'sedan': False,
'suv': False,
'truck': False,
'coupe': True,
'convertible': False,
'electric': False,
'hybrid': False,
'gas': True,
'luxury': True,
'sports': True,
'off_road': False,
'all_wheel_drive': False,
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'domestic': False,
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  'coupe': True,
  'convertible': False,
  'electric': False,
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  'gas': False,
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  'off_road': False,
  'all_wheel_drive': False,
  'front_wheel_drive': False,
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  'seats_4': False,
  'seats_5': False,
  'seats_7plus': False,
  'expensive': True
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  'convertible': False,
  'electric': False,
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  'gas': True,
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  'off_road': False,
  'all_wheel_drive': False,
  'front_wheel_drive': False,
  'rear_wheel_drive': True,
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  'seats_4': False,
  'seats_5': False,
  'seats_7plus': False,
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  'coupe': False,
  'convertible': False,
  'electric': False,

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    'sports': False,
    'off_road': True,
    'all_wheel_drive': True,
    'front_wheel_drive': False,
    'rear_wheel_drive': False,
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    'seats_2': False,
    'seats_4': False,
    'seats_5': False,
    'seats_7plus': True,
    'expensive': False
  }
}

```

This is a cars attributes dataset. I have a hidden car in mind. You are allowed to ask me binary questions about the hidden car's attributes, for you to figure out the hidden car.

After receiving an answer, at each step, you must print what your current belief distribution is and the calculated entropy drop, about the possible hidden car.

We can stop when there's no more distinguishing attributes between the leftover options. You're not allowed to solve this using programming.

First question: Is the car classified as an **SUV** (sport-utility vehicle)?



No.

### Current belief distribution (uniform over the 60 remaining non-SUV models)

Each model has probability  $\approx 1/60 \approx 1.67\%$ .

- Acura NSX
- Alfa Romeo Giulia
- Aston Martin DB11
- Aston Martin Valkyrie
- Audi A4
- Audi R8
- Bentley Continental GT
- BMW 3 Series
- BMW i3
- Bugatti Veyron
- Cadillac CTS

- Chevrolet Bolt
- Chevrolet Camaro
- Chevrolet Corvette
- Chevrolet Silverado EV
- Chrysler Pacifica Hybrid
- Dodge Challenger
- Dodge Charger
- Ferrari 488
- Ford F-150
- Ford Maverick
- Ford Mustang
- Genesis G70
- GMC Hummer EV
- GMC Sierra
- Honda Accord
- Honda Civic
- Honda Odyssey
- Hyundai Elantra Hybrid
- Hyundai Ioniq 6
- Hyundai Sonata Hybrid
- Infiniti Q50
- Jaguar F-Type
- Jeep Gladiator
- Lamborghini Huracán (hybrid)
- Lexus LC 500
- Lotus Emira
- Lucid Air
- Mazda MX-5 Miata
- McLaren Artura
- Mercedes-Benz S-Class (hybrid)
- Mini Cooper
- Mitsubishi Mirage
- Nissan Altima
- Nissan Leaf
- Nissan Z

- Polestar 2
- Porsche 911
- Porsche Boxster
- Ram 1500
- Rivian R1T
- Rolls-Royce Phantom
- Subaru BRZ
- Tesla Model 3
- Tesla Model S
- Toyota Camry
- Toyota Corolla
- Toyota Prius
- Toyota Sienna
- Volkswagen Golf

### Entropy drop after the first answer

- Initial entropy (100 equally likely cars):  $H_0 = \log_2 100 \approx 6.64$  bits
- Entropy after ruling out all SUVs (60 equally likely cars):  $H_1 = \log_2 60 \approx 5.91$  bits

$$\Delta H = H_0 - H_1 \approx 0.74 \text{ bits}$$

---

### Next binary question

Is the car marked **“sports: True”** in the dataset?



No.

### Updated belief distribution (uniform across the 30 remaining non-SUV, non-sports models)

Each model now has probability  $\approx 1/30 \approx 3.33\%$ .

- Audi A4
- BMW 3 Series
- BMW i3
- Cadillac CTS
- Chevrolet Bolt
- Chevrolet Silverado EV
- Chrysler Pacifica Hybrid
- Ford F-150

- Ford Maverick
- GMC Hummer EV
- GMC Sierra
- Honda Accord
- Honda Odyssey
- Hyundai Ioniq 6
- Infiniti Q50
- Jeep Gladiator
- Mercedes-Benz S-Class
- Mini Cooper
- Mitsubishi Mirage
- Nissan Altima
- Nissan Leaf
- Polestar 2
- Ram 1500
- Rivian R1T
- Rolls-Royce Phantom
- Tesla Model 3
- Tesla Model S
- Toyota Corolla
- Toyota Prius
- Toyota Sienna

### Entropy drop for this step

Entropy after Step 1:  $H_1 = \log_2 60 \approx 5.91$  bits

Entropy after ruling out all *sports* cars:  $H_2 = \log_2 30 \approx 4.91$  bits

$\Delta H = H_1 - H_2 \approx 1.00$  bits

### Next binary question

Is the car marked “**luxury: True**” in the dataset?



Yes.

### Current belief distribution (uniform across the 14 remaining cars)

Probability for each model  $\approx 1/14 \approx 7.1$  %.

- Audi A4

- BMW 3 Series
- BMW i3
- Cadillac CTS
- Chrysler Pacifica Hybrid
- GMC Hummer EV
- Honda Accord (Hybrid)
- Infiniti Q50
- Mercedes-Benz S-Class (Hybrid)
- Polestar 2
- Rivian R1T
- Rolls-Royce Phantom
- Tesla Model 3
- Tesla Model S

### Entropy drop for this step

Entropy after the previous step:  $H_2 = \log_2 30 \approx 4.91$  bits

Entropy now:  $H_3 = \log_2 14 \approx 3.81$  bits

$\Delta H = H_2 - H_3 \approx 1.10$  bits

---

### Next binary question

Is the car listed as **electric = True** in the dataset?



Yes.

### Updated belief distribution (uniform across the 6 remaining cars)

Each model now has probability  $\approx 1/6 \approx 16.7\%$ .

- BMW i3
- GMC Hummer EV
- Polestar 2
- Rivian R1T
- Tesla Model 3
- Tesla Model S

### Entropy drop for this step

Entropy after Step 3:  $H_3 \approx \log_2 14 \approx 3.81$  bits

Entropy after keeping only electric cars:  $H_4 \approx \log_2 6 \approx 2.58$  bits

$\Delta H \approx 3.81 - 2.58 \approx 1.23$  bits

---



### Next binary question

Is the car classified as a **sedan** in the dataset ( ``sedan = True`` )?



Yes.

**Current belief distribution (uniform across 3 models)** – each now has probability  $\approx 1/3 \approx 33.3\%$ .

- Polestar 2
- Tesla Model 3
- Tesla Model S

### Entropy drop for this step

Entropy after the previous step:  $H_4 \approx \log_2 6 \approx 2.58$  bits

Entropy now:  $H_5 \approx \log_2 3 \approx 1.58$  bits

$\Delta H \approx 1.00$  bits

### Next binary question

Is the car flagged "**expensive = True**" in the dataset?



No.

### Updated belief distribution

Only two models fit all answers so far, each with probability 50 %.

- Polestar 2
- Tesla Model 3

### Entropy drop for this step

Entropy before this answer:  $H_5 \approx \log_2 3 \approx 1.58$  bits

Entropy now:  $H_6 = \log_2 2 = 1.00$  bit

$\Delta H \approx 0.58$  bits

### Next binary question

Is the car marked "**domestic = True**" in the dataset?



Yes.

### Current belief distribution

Only one model satisfies all answers – probability 100 %.

- Tesla Model 3

**Entropy drop for this step**

Entropy before this answer:  $H_6 = \log_2 2 = 1.00$  bit

Entropy now:  $H_7 = \log_2 1 = 0$  bits

$\Delta H = 1.00$  bit

Since there is no longer any ambiguity, the hidden car must be the **Tesla Model 3**.